HOPKINS BULLETIN

a record of research

SEPTEMBER, 1953

Vol. 25

PUBLISHED QUARTERLY BY
THE JOHNS HOPKINS PRESS, BALTIMORE, MARYLAND

HUMAN BIOLOGY

a record of research

FOUNDED BY RAYMOND PEARL

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HUMAN BIOLOGY is published quarterly by The Johns Hopkins Press, Baltimore, Maryland, U. S. A. The advance subscription price is $5.00 a year (foreign postage 35 cents; Canadian 15 cents). Single current issues are $2.00 each, plus postage.

Subscribers should notify the publishers of change in address at least two weeks before publication of the issue with which change is to take effect. No claim for non-receipt of an issue will be entertained unless made immediately upon receipt of the next succeeding issue.

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THE JOHNS HOPKINS PRESS, *Publishers*

BALTIMORE—18, MARYLAND, U. S. A.

Entered as Second Class matter, February 18, 1929, at the Post Office at Baltimore, Md., under the Act of March 3, 1879.

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POPULATION AS THE UNIT OF STUDY IN HUMAN BIOLOGY

Chiefly by chance and only slightly by design, the editors find virtually a whole issue of *Human Biology* devoted to demographic studies. But should one call it chance when a series of unrelated papers, although on widely divergent subjects, turn up at one time on the editor's desk with a common theme? Instead, it may signalize a meaningful current emphasis on the relation between human biology and demography. One of the articles is by a sociologist and a demographer who found it important to start with a census of the Hutterites in order to measure their mental public health. The census revealed an unusually high fertility and a population that, without immigration, increases itself at a much greater rate than any previously studied. A second article is by an applied anthropologist who finds population characteristics important in respect to human ecology. In this study of an American Indian village, vital statistics are viewed in the light of the cultural and physical environment of the group. The third is a brief attempt at the reconstruction of demographic characteristics of historic peoples from such literary sources as the Bible. The fourth article is by an ethnologist. He presents data on intertribal mating of Australian aborigines at the time of first contact

with Europeans. This study of a stone-age people will permit estimation of one of the variables—the rate of intermixture—which physical anthropologists use in calculations based on the genetic theory of the evolution of human races. When we apply this theory to the question of human evolution, the high rates of intergroup mating which are here reported for the Australian aborigines lend weight to the argument that in man there must always have been a considerable tendency towards race amalgamation.

Population, then, is the unit of study in some modern approaches to the evolution, genetics, and ecology of man. It should be one of the central themes of our journal. As one correspondent commented, " There are an increasing number of research problems in which biologists and demographers are looking at the same phenomena, sometimes the same data, with related but somewhat different goals and quite different analytic procedures."

Human Biology, of course, is not to be limited to demography any more than to physical anthropology, biostatistics, or any other single aspect of the field. In the future we may wish to emphasize—perhaps again with a group of articles—the relevance of human biology to some other discipline, nutrition, for example, or immunology. However, in maintaining our independence of any one professional group, *Human Biology* risks the loss of the support which such affiliation can give. The convergence of interests of human biologists and demographers should have two facets. On the one hand, more readers of *Human Biology* may wish to join the Population Association of America * and thereby identify themselves with others who have a serious interest in the scientific study of population. On the other hand, demographers can increasingly support *Human Biology* through contributing articles and through subscribing.

GABRIEL LASKER

* Population Association of America, c/o National Office of Vital Statistics, Department of Health Education and Welfare, Washington 25, D. C. Secretary: Hugh Carter. Dues: $3.00. Members receive the Population Index and other publications.

MILK "LET-DOWN" AND THE ORGASM IN THE HUMAN FEMALE

BY BERRY CAMPBELL AND W. E. PETERSEN

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THE nature of the phenomenon of milk let-down in the cow has been investigated by one of us (Petersen '44) and has been demonstrated to be a result of release in the blood stream of the oxytocic principle. This has been shown to be induced, under ordinary conditions, reflexly by sensory stimulation of the udder. The 45 seconds usually intervening between the application of the cutaneous stimulation to the teats and udder and the response in the parenchyma of the gland in the lactating cow is sufficient for and consistent with a reflex phenomenon having a neural afferent leg and a hormonal efferent leg of the arc. The phenomenon is of similar nature in the human female, as many published observations as well as those of the present authors indicate. Both sensory and psychic stimuli serve to evoke the milk let-down in the lactating female and the observation of the phenomenon is commonplace though frequently subjective in the woman herself. Where much milk is present, or the nipple sphincters are faulty, it may be observed by others as a running of milk from one breast as the infant is put to the other. The clinical importance of this phenomenon in the instance of its failure in lactational non-performance in women has been commented upon in an earlier publication (*loc. cit.*) and by Newton and Newton ('50).

The purpose of the present communication is to report a series of observations which lead the authors to the view that an extension of the phenomenon of milk let-down is to be observed in lactating females subject to sexual stimulation, and to examine the implications of these data in relation to the biology of the female orgasm.

Despite the wealth of literature, recent and early, dealing with the female sexual response, considerable confusion exists as to its real nature and place in the economy of the individual. Some authors consider the female orgasm as exact a homologue of the male phenomenon as the anatomy of the parts will allow. Others consider the essential response to be a completely subjective one, i. e. psychic, and not observable to others but only to be inferred (Ford and Beach, '51, p. 252). As to its place in bodily economy, opinions vary from the view that it is of no importance to the reproductive act to the possibility that it is facilitatory if not essential to the sequence of events leading to fertilization. It is believed that the following observations may explain some of the confusion which has beclouded this subject and, perhaps, lead to a more productive hypothesis by which sexual responses may be studied.

Five human cases in which milk let-down in the human female has been correlated with sexual responses have been studied. Each has been observed by a physician or a scientist. The one for which there are the most observations is a multiparous woman, who observed with each of her 4 lactating periods that the sexual act usually resulted in a copious flow of milk. This might not have been observed so clearly, or possibly not at all, if it were not for the fact that the nipple of her left breast was somewhat inadequately supplied with a sphincter. In this subject, the milk let-down at nursing was more observable than usual and could be seen to result from the anticipation of putting the baby to the breast. Thus, in this instance, cutaneous stimulation was not essential.

The other four cases were essentially similar but have not been studied with the same thoroughness of the instance reported above. An important agreement between the cases is that in regard to the let-down of milk during sexual intercourse, there was observed a correlation between the fullness of the sexual response and the let-down phenomenon, it being much more marked when the woman felt a greater sexual response had been achieved.

Additional observations of this phenomenon have been made in cows. Cannulation of the teat canal has not been employed but observation of the let-down phenomenon has been made by virtue of the sudden turgidity of the lower portion of the udder and teats or by dripping of milk. Two instances in which the let-down was seen during copulation are reported. Another, equally interesting case, in which a veterinarian provoked a milk let-down by the manipulations involved in making a rectal palpation of the uterus is considered by us to be significant. Reference should be made to the detailed and similar observations reported by Van Demark and Hays ('52).

The significance of these phenomena seems to us to be that they offer support to the hypothesis that in human sexual behavior—as well as that of the cow and certain other mammalian species—the female copulatory response is essentially a double entity. There appears to be an essential component, of the nature of a neuro-humoral reflex, involving the oxytocic principle of the posterior hypophysis and possibly—in

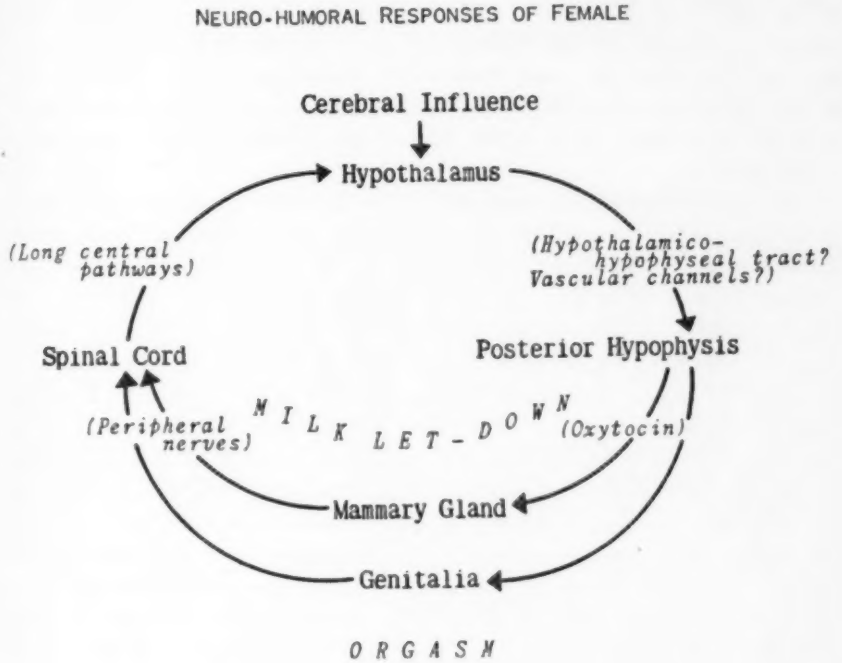

FIG. 1.

view of the well known ovulatory response to coition in rabbits and other species—hormones of the anterior lobe of that gland (Figure 1). This results from the stimulus of erogenic zones and also psychic influences with activation of visceral effectors through the hormone system. The biologically essential features of female reproduction—oestrus, sperm transport, ovulation, and lactation are integrated in this way—apparently in a single sequence of events in certain species. What is popularly known as the female orgasm may in whole or in part be represented by a vestigial male behavior pattern, with a fundamentally different organization. The essential responses of the male orgasm consist of erection

of the genitalia, the copulatory act, and a burst of motor activity of the musculature of the genitalia at ejaculation. That the male pattern is resident as a separate entity in the behavioral organization of the female mammal has been shown and discussed by Beach ('38). Such behavior is commonly observed in domestic animals. That it is scarcely to be found in the infrahuman primates (Ford and Beach, '51) is a matter of interest to which we will later return. The immediate point of the discussion is that not only is the motor activity associated with orgasmic behavior in the human female a somewhat variable series of contractions of vestigial and functionless homologues of the musculature of the male genitalia, but there seems to be a consensus that such a response depends greatly upon stimulation of the clitoral homologue of the penis.

The acceptance of the view that the human female orgasm is a double behavioral entity consisting of an essential neurohormonal reaction of smooth muscle organs not represented in the male and a usually concurrent vestige of a male behavior pattern typified by contraction of the homologues of the muscles of ejaculation would have certain interesting and clarifying consequences. The lack of strong correlation between fertility and orgasm as usually defined not only in women but in domestic animals subject to artificial breeding would be understandable in view of the fact that it is the vestigial and non-essential male behavior with which the correlation is attempted. The real female orgasm, as detected by milk let-down or by blood hormone levels, may well have a high correlation with the success of the reproductive act. It would aid in explaining one of the more surprising findings of reproductive behavior of the infrahuman primates, where any visible sign of a female orgasm (as usually defined) is absent (Ford and Beach, '51). Such a view would have implications in the fields of sociology and mental health which would need exploration.

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TRIBAL AND INTERTRIBAL MARRIAGE AMONG THE AUSTRALIAN ABORIGINES

BY NORMAN B. TINDALE

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INTRODUCTION

THIS paper brings together field data on the ratios of tribal to intertribal marriages among Australian tribes whose cultures have not been grossly disturbed by the effects of European contacts. Such data had hitherto not been gleaned for the Australian aboriginal. It may be important as background information for those interested in many different aspects of the study of human gentics. Along with data now being collated, as to interval between generations, it may serve to indicate the likely general rates of transmission of genes from one group to another among primitive peoples at the cultural levels of Australian hunting peoples.

The researches on which the paper is based were made possible by grants for field work from the South Australian Government, the Carnegie Corporation of New York, the Wenner-Gren Foundation, the University of Adelaide and the South Australian Museum.

The material was brought into focus and tested by reexamination of methods etc., after the 16th Expedition of the Board for Anthropological Research, University of Adelaide, which visited Yuendumu, Central Australia in August 1951.

The paper is offered in its present form at the request of my colleague Dr. J. B. Birdsell, who was a fellow worker on one of the principal expeditions, when about one-half of the data for it was gathered.

All the genealogical data on which it is based were recorded by the present writer, and have been checked with official data where such exist. The raw material is preserved on a series of record cards and in seven large folio manuscript volumes of genealogies which are lodged for per-

manent preservation in the South Australian Museum by the Board for Anthropological Research at the University of Adelaide.

The territories and names of tribes referred to, with one exception, the Wenamba, discussed herein, are shown on the map published by Tindale ('40).

This map in general gives an appreciation of tribal territories at the time of early white contacts and is approximately accurate only as reflecting conditions at a given moment of time just before disruption by European intereference.

RANGE OF MOVEMENTS OF AUSTRALIAN ABORIGINES

Epipalaeolithic hunter-tribesmen, as typified by the Australian aboriginal, were nomadic within a tribal area, and were closely tied to this territory by the continuous necessity of gathering the day's food and spending the greater part of each day doing so, leaving little time for other activities, save at a few especially favorable seasons of the year. They had limited means of travel and, should they wish to move from their living area, faced ecological barriers and physical obstructions as well as hostile opposition from armed owners of adjoining tribal territories. They suffered also psychological fears if they came to trespass on unknown territories, and when confronted with new foods they had not previously encountered. Despite their continual wanderings they were not widely travelled.

Study of tribal habits suggests that transmission of human genes across Australian territory probably has taken place in several ways, of which the following are significant: (a) by migratory movements either of tribes, of hordes or of families. (b) by intermarriages followed by movements of individual husbands or wives of one group to the territory of the other, (c) rather more rarely by the movements either of couples who have transgressed marriage laws in one tribe or who have made intertribal marriages against others wishes and then shifted elsewhere, sometimes as refugees from tribal justice, and (d) sanctioned sexual license across tribal boundaries where tribes meet for ceremonies. In exceptional cases casual choice or unusual opportunity has determined the transgression of a tribal boundary.

The main modes of possible migration of genes are discussed below in more detail.

TRIBAL MOVEMENTS

In the past mass tribal movements probably have occurred in Australia and some actually were occurring at the time of early contacts with Europeans. Some of the known early movements have a southward component, a few were in the diametrically opposite direction.

The Pintubi tribe studied in this paper, in common with the Pitjandjara and Jumu, have made considerable south-eastward movements, of the order of 50 to 100 miles during the past several generations; their latest shifts were initiated in 1916, after a severe drought had forced them to travel away from their usual territory. The Pitjandjara, for example, in usurping the present eastern half of their country, ambushed and killed many Jangkundjara. About one-half of the surviving Jangkundjara shifted their living area to the vicinity of Ooldea to escape the Pitjandjara. Present day Pitjandjara totemic places are all west of the Musgrave Ranges, although one-half of the modern territory of the people is about that Range, and once all of it lay beyond their eastern boundary. The Jangkundjara people whom they displaced had previously occupied the same territory for at least several generations.

There is evidence that the Kokata and Pangkala tribes further south had shown similar south-easterly movements during a period of over half a century, prior to 1914. How far these movements either were intermittent, continuous, or even at times reversed is not known.

The forces determining migration are not easy to ascertain, but the highly variable rainfall of the desert regions is an obvious cause, and high population pressure is evident also as a factor since in a long run of good seasons many children are born in the desert areas.

The afore mentioned Pitjandjara movements do not seem to have been caused by any decline in numbers, and hence of prestige and power of resistance, of tribes-people who opposed them on the east. It is true that the eastern tribes, including the Kukatja, Jumu and Jangkundjara have been on the outer fringes of white occupation since the turn of the century, and therefore might be thought to have weakened. However the movements south-eastward seem to have been initiated before any disturbance patently due to white influence.

Later day movements, due primarily to Post-European releases of population pressure caused by the dying out of tribes living near to areas of white settlement, are well known and are to be distinguished from these earlier movements. Thus with the virtual disappearance of the civilised Wirangu tribespeople on the West Coast of South Australia

after 1910, the inland Kokata came to the coast about 1920, and now tend to regard it as their territory, even though they remember the desert to the North as their former home. They also have come to regard Port Augusta, once in Pangkala territory, as now in their country, for the Pangkala have all died out in contact with whites.

Although it seems to us that the earlier movements were "natural" it is of course difficult to assess what might have been the nature of the tribal dislocations and disturbances due to events such as the smallpox epidemic which swept across Australia from coast to coast in the 1830's and in some areas greatly reduced the population. This smallpox epidemic probably was introduced by the Malays who then frequented the northern coasts of Australia. These Malays perhaps had done so for centuries. In this event it might be thought to be a "natural" or a "Non-European" effect on the Australian population.

Studies in the material cultures, languages, and traditions suggest that in Central Australia a slow southward drift has been going on over an extensive period of time, but other movements show a northward trend from the MacDonnell Ranges in the direction of the Tanami plain. In the cases of the Pitjandjara, Jumu, Pintubi and similar tribes the reality of the movements is reflected in their totemic beliefs and ceremonies, for many of their rites and stories have their settings in places up to 100 miles west of their present places of living. Ngalia mythological tales show a trend; a movement towards the MacDonnell Ranges from the west and then one north from near Winbaruka (Blanche Tower) to their present locations centering on Mt. Doreen.

EXTRA-TRIBAL MARRIAGES

Gene flow is possible, in the absence of tribal movements, and of direct physical contact made by native messengers, to the extent that intertribal contacts and marriages take place.

Where areas and population are comparable in size etc., extra-tribal marriage rates of the order of, say 5% will cause a much lower rate of transmission of genes than where up to say 35% of marriages may be extra-tribal.

For a group of the Ngadadjara people living in the Warburton Range, Western Australia, as observed by the present writer, in 1935, we have a record of 42 remembered marriages; yet among these people, 9 were extra-tribal marriages linking them to adjoining tribes. One of these was with a member of the Nana tribe, a neighboring group to the

northwest. This marriage had taken place perhaps 15 years prior to 1935 when a Nana man had taken away a Ngadadjara woman. A meeting of these two tribes, for the first time since that event, was witnessed in the Warburton Range, August 1935, by members of the 11th Expedition of the Board for Anthropological Research, University of Adelaide. On this occasion the Nana group chanced to come from the northwest, seeking water at Warupuju, having been forced thereto by drought in their own territory. After this interval of time the woman had borne one boy child whose tribal affiliation was hybrid although he was regarded, following his father, as a Nana child. In the same Ngadadjara tribe there were 7 marriages with Pitjandjara and one with Mandjindja. On this basis just over 21% of marriages were extra-tribal.

Among about 150 Pitjandjara encountered in the Mann Range in June 1933 there was one Pintubi woman whose Pitjandjara husband had received her by an intertribal exchange marriage. (Incidentally with her he had received a suite of unwanted secret ceremonial objects for which he and his tribe had little use.)

In all but one of the above instances the woman was the one whose area of abode had been changed by the marriage and this seems to be very general in Australia where, typically, marriages are patrilocal. In the Ngalia tribe studied in detail in the next section of this paper there were several instances where the reverse was the case. Matrilocal displacement of marriages have been reported as well in other places but they tend to be less than patrilocal ones.

It is evident that among the Pitjandjara and Ngadadjara intertribal unions were not unusual events and fitted properly into their life patterns. The instances were ones which had taken place among people who had not been in close contact with Europeans at any time prior to these marriages and at the time the observations were made were still living their full life as Epipalaeolithic hunters. Indeed so completely unaffected were they, that they still were using exclusively stone implements for their daily work of spear making, dish and implement cutting, and food gathering.

The existence of intertribal marriages therefore must be accepted as normal, since people who encounter each other on the margins of tribal territories, though often nervous in each other's presence, apprehensive, and often at enmity, do engage in barter, occasionally do give women in intertribal marriage, and though they fight, and kill, either to hold their territory, or to usurp that of others, they do extend hospitality to those in need of water or temporary subsistence. Such courtesies might

be thought by some to be more characteristic of western Desert Tribes, but they seem also to be present in populations less subject to arid climate vagaries. For instance among the Tanganekald of the Coorong in South Australia an elaborate system of allotting temporary living space was practiced when droughts made it necessary to share food. In the desert areas attitudes of hostility seem to be tempered by the knowledge that today's owners of food and wells of water, by tomorrow, of necessity may be waiting on the good will of others who by reason either of good fortune or successfully conducted magical rites have enticed to their land a thundercloud full of water, and so have obtained life-giving rain for their hunting area.

INTERTRIBAL MARRIAGES IN A SELECTED TRIBE—THE NGALIA

In the Yuenduma area of Central Australia the principal tribe, now to be studied, is the Ngalia, one of the so-called Walpari (Walpiri, Alpiri, Ilpira) tribes. The last named term appears to be a blanket one applied in the area north west of Alice Springs to several desert dwelling peoples speaking non-Aranda-type languages.

Ngalia territory extends from just west of Cockatoo Creek westward to the vicinity of Konadjarai (Coonajarrai of maps), south to the salt marshes which run along the south side of Stuarts Bluff Range and along its westward extension, the Jupareri Range (a native name not yet on maps). The center of their territory lies at about 131° 0′ East Longitude by 22° 10′ South Latitude. They go also to south of Mt. Stanley (Karko), to Mt. Cockburn (Winatata), and to the sandhills and the spinifex-grass-covered sand desert country north of Mts. Singleton, Doreen and Hardy. The area occupied by the tribe is approximately a rectangle, 75 by 150 miles, comprising roughly 11,000 square miles, and supporting 400 aborigines. It thus furnished living areas of between 25 and 30 square miles for each person, a relatively dense population when compared with other areas where there are up to 150 square miles per person. The country comprises a central core of mulga (*Acacia aneura*) scrub among granite ranges and a peripheral zone composed of sand plains covered with "spinifex" grass (*Triodia*).

The aborigines of this tribe probably saw such nineteenth century explorers as Warburton, who made his nineteenth camp west of Mt. Eclipse on May twelfth 1873, and Gosse who camped at Cockatoo Creek on May nineteenth 1873. Both refer to having seen clues to the existence of natives or had brief encounters with them. Although brief visits

were made by other explorers (e. g. by Barclay in 1911), it was not until well after World War I that the country began to be frequented by whites prospecting for precious metals. Wolfram was located by the late Alec Ross in August 1926 at Mt. Doreen. W. W. Braitling first visited Mt. Doreen in May 1926 (and later settled there in 1932). Shortly after Braitling's first visit, a white man, Brookes, was killed by Ngalia natives (1928) and on two occasions police punitive expedition killed members of an eastern horde of Ngalia natives near Cockatoo Creek. For most of the adult Ngalia aborigines alive today their earliest recollections of Europeans were of contacts with Ross and with Braitling in 1926 or at various dates thereafter.

The Ngalia have as northern neighbors the Walmala, another of the so-called Walpari tribes, whose territory embraces the desert plain extending north west from Cockatoo Creek to the Granites and north east to Lander Creek. The chief present day home of the Walmala is at the Granites. Messrs. W. Morton and S. Sandford settled on the lower Lander Creek in May 1926 and two years later the Walmala natives made an attempt to kill the former. Their adjustment to European occupation commenced at about that date.

East of Cockatoo Creek is the territory of the Anmatjera, who speak an Aranda type language. Because of the very considerable language differences, the separation between Ngalia and Anmatjera is a marked one. The Anmatjera first clashed with whites in an attack on the newly erected Barrow Creek Telegraph Station in 1874. This event is still remembered by one (now very aged) native who was present in the vicinity as a boy. After this episode they had relatively few contacts with whites until the first period of pastoral expansion. Their territory was disrupted by the taking up of Conistan Station for cattle in 1920.

West of the Ngalia live the Wenamba or Wenanba, still (1951) not in direct or constant contact with whites, although some of them visited Ngalia territory in 1950 and a few natives, probably of this tribe or of the Kukuruba, were met during a recent reconnaissance of the little known area north of Lake Mackay by W. W. Braitling.

Much of Ngalia territory has been opened for general pastoral settlement in the past decade, and a ration depot is established at Yuendumu to provide for natives whose hunting territories have been disturbed by the advent of cattle. The period of intense disruption of tribal life is therefore short; three marriages only are ones in which native law has been broken and only a small handful of halfcastes has been born.

The authority and power of the native old men is only now beginning to weaken, as young natives, lately educated as stockmen, begin to assert themselves through their superior opportunities for contact with the Europeans whose cattle they tend.

With this background it becomes evident that it is possible to obtain interesting and significant data on marriages initiated prior to European influences and also to examine the histories of the several instances of departure from the more usual marriages within the tribe.

Original data for the group was obtained by the present writer during a visit to Cockatoo Creek in 1931 (7th Expedition of the Board for Anthropological Research, University of Adelaide), and gathering of data was repeated and amplified during the 16th Expedition, in August 1951.

Genealogies were gathered on 103 sheets. They give some data on about 163 Ngalia marriages. Records of some of the marriages appeared independently on several different genealogical sheets; some were listed first in 1931 and the same data recorded again in 1951 and for still others information, independently gathered, appeared in an official list prepared at Yuendumu Station in 1946 for a Census of natives. Hence cross checks on the data often were available. In 156 marriages for which data as to tribe was ascertained the following tribal relationships were found to exist between the marrying parties.

TABLE 1

Tribal and intertribal marriages

TYPE OF MARRIAGE	NUMBER OF INSTANCES
Ngalia man married Ngalia woman	144
" " " Pintubi woman	1 (adjoining tribe)
" " " Anmatjera woman	1 (" ")
" " " Jumu woman	1 (" ")
" " " Walmala woman	1 (" ")
" " " Aranda woman	1 (1 intervening tribe)
Ngalia woman married Walmala man	2 (adjoining tribe)
" " " Pintubi man	2 (" ")
" " " Aranda man	3 (1 intervening tribe)

From these details it appears that of those who made intertribal marriages, Ngalia men comprised 3.2% and Ngalia woman totaled 4.5%. Extra-tribal marriages therefore were of the general order of 8%. On

this basis it would appear that Ngalia contacts with other tribes were relatively few. This may be accounted for by peculiarities in their geographical situation. Their best country is the Mt. Doreen area, a relatively fertile strip of granitic country with "sand soaks" in creeks and many rock hole waters. This good country is embraced in almost every direction by "spinifex" grass covered sand plains which were very unattractive as places of native residence and likely to discourage the passage of outsiders. Nevertheless it would appear that Ngalia men have taken other women in marriage and men of surrounding tribes, having obtained Ngalia women as wives have come to live permanently with their wives, therebye swelling the effective number of intertribal marriages in the Ngalia area. Of 12 intertribal marriages 8 were with members of adjoining tribes and in 4 instances with members of tribes once removed.

The three instances noted where Aranda men of a non-contiguous tribe have come into the area and married Ngalia women appear old enough to be allowed as free from direct European influences. In each instance the man concerned appears to have come to the Ngalia country relatively early in life to escape a feud, and has remained. The marriage of the Aranda woman with a Ngalia man listed above is recent, and the woman has had ties with Hermannsburg Mission. However, the marriage seems to have occurred as a direct and logical result of one of the earlier series of mixed Aranda marriages and possibly would have taken place even if the Aranda had not come under European influences. If, to be on the safe side, we disallow it the percentage figure is about 7.5% for intertribal marriages made by Ngalia people (based on the observation of a total of 155 marriages).

In addition to the simple intertribal marriages referred to above there was one instance where a "Ngalia" man, himself a product of an earlier Ngalia man X Jumu woman marriage, wedded an Anmatjera woman whom he brought to live in the territory of his father. Taking into consideration this anomalous instance the degree of tribal intermarriage is about 8%.

In compiling the above data on marriages, three recent ones known to have been directly influenced by Europeans and by rapidly increasing present day European contracts have been rejected as unsuitable for inclusion. In two of the rejected instances the subjects are trusted cattle station hands, Ngalia men with knowledge of English. This knowledge they obtained through early attachments to Europeans by whom they were taken away from Ngalia country. These two men have

used their prestige to force "wrong" marriages with Ngalia girls. Further details of such "wrong" marriages are to be given in a separate paper dealing with the social organization of these people. Although Ngalia 8-class marriage rules tend to allow some *ngawuru* (mother's brother's daughter) marriages, there had not been any for some time and these particular ones which directly flouted the old men's arrangements were not very acceptable to the group. The third marriage also omitted from the lists is one bitterly opposed because, under missionary influence and through bribery (with trade goods and food to the claimed value of £10) a young Ngalia woman, promised from birth to an older man, had recently (February 1950) been married to a young man. This, the first church wedding among the Ngalia, transgressed their native law since a Tjungarai man had married a Nakamara woman, i. e., had taken to wife a person who stands in the relationship of "father's wife."

These three marriages are the main ones which have transgressed native sentiment and the consummation of one of them has been blamed for several grudge killings, including an affair of April 1951 when two natives lost their lives and about 40% of the native population left the vicinity of the Government Station and had not returned at the end of 4 months after the fracas.

Since marriages among the Ngalia are in general arranged while the girl is still in infancy, or may even be arranged prior to birth of a child, on a contingent basis, even the most recent marriages, other than these three cases, reflect the normal practice of the natives before being subject to European influences, and there can be little hesitation about their acceptance.

Data on an additional 4 marriages had to be omitted either for lack or for partial lack of tribal data.

It was very difficult to obtain information about anyone who is dead. Ngalia people seem less inclined to talk of the dead or to recall their names than any other Australian tribes-people encountered by the present author. The suppression of references to deceased ones is so complete as quickly to destroy remembrance of details of marriages etc. Hence, in this Ngalia study, data could not readily be obtained for previous generations sufficiently far back to test whether or not there might have been any changes in rates of inter-marriages with passage of time. All the data therefore has been pooled to obtain the information summarized in preceding paragraphs.

DATA FROM THE HARVARD-ADELAIDE UNIVERSITIES ANTHROPOLOGICAL EXPEDITION 1938-1939

Data on tribal and intertribal marriages of full-blooded aborigines in some degree comparable with that for the Ngalia, are contained in the genealogies of native families recorded by several earlier expeditions of the Board for Anthropological Research with which the present writer has worked, although it was not specifically gathered with the intention of recording this particular facet of native life.

During the Harvard and Adelaide Universities Anthropological Expedition 1938-1939, a very large amount of data was obtained during studies in 5 States. This Expedition worked chiefly among detribalized remnants of peoples, but information was gathered on some marriages initiated prior to disturbances due to advent of Europeans. When tabulated these have yielded some useful information.

LIMITATIONS OF THE 1938-1939 DATA

Since knowledge of exact dates for such marriages usually are absent and the actual time of first contacts is known only broadly for each area, the data are not as exact as might be desired and subjective judgments may have gone into the assessments of some borderline cases.

Cases where the woman whose marriage was being considered had borne full-blooded children (prior to having had one by a European) were usually not difficult to assess for inclusion in the data for the birth of halfcastes takes place principally in the first few years of direct contact with whites. If the circumstances indicated the marriage had indeed taken place prior to any period of systematic contact between the aboriginal group and whites, the data on the marriage were taken into account. For some areas marriages of as late dates as the 1920's and 1930's could safely be included, whereas in others (for example parts of South Queensland), marriages after about 1850 had to be excluded. For South Eastern Australia, therefore, there is not as much information as desirable and in much of New South Wales and Victoria little useful material was forthcoming.

In tabulating intertribal marriages patrilocal residence has been assumed except where there is data indicating the contrary. This may have led to a few anomalies in the setting out of the tables. As an example the details for the Idindji tribe show few intertribal marriages since few woman were imported into the tribe. However for the Mamu,

Ngatjan and Gulngai tribes relatively numerous intertribal marriages with Idindji women are recorded since Idindji women did go to live among these tribes. The discrepancies may be more apparent than real. In this particular instance it is difficult to assess how far the situation might have been caused by early day clashes between the Queensland native police and Idindji coastal aborigines. In the "bad days" of the 1890's there was much killing off of male natives during Native Police raids in coastal areas not settled by whites. Surviving women may have gone inland in marriage. On other evidence it is known that intertribal marriages were common in this particular area and were sometimes due to the stealing of women from one group by another and the disparity in numbers may be due to the greater advantage held by mountain people over those confined to a sand-beach and coastal plain, as described to me by some Kongkandji men.

Intertribal marriages which are directly due to European disruption usually begin when aboriginal men, in contact with Europeans and trained as stockmen or police-trackers, take women of tribes in less contact with whites. Police-trackers, stockmen, and in the early days of Queensland, native police, were the initiators of this Post-European contact type of intertribal marriage.

A good example observed during the 1938-1939 study is that of a Nangatadjara man, 44 years of age, at Laverton, Western Australia who had worked with whites for 13-14 years prior to 1939. His history shows that about 1930 he took as wife a Ngadadjara woman of one of the southern hordes of that tribe. At this time the main body of Ngadadjara were just coming to be known to whites but were not in close contact with them. Earlier than this the two tribes had not had intermarriages.

Changes in the marriage pattern among disrupted tribes is exemplified by the crop of intertribal marriages which took place after 1935 when the above mentioned Ngadadjara, having found their way into Laverton township, freely gave their womenfolk to men of Europeanized tribes, including some natives who had, for years, been in contact with white men on the Kalgoorlie Goldfields.

TRIBAL AND INTERTRIBAL MARRIAGES—THE 1938-1939 DATA

In the following paragraphs the lists of tribal and intertribal marriages given in the appendix are arbitrarily grouped into several blocks. The areas chosen are those used by us in some other analyses of data

on the Harvard-Adelaide Universities Anthropological Expedition and their general distribution is as shown in figure 1.

Taken tribe by tribe these marriage records may not, because of their limited numbers, give a good picture but when gathered into large blocks of tribes they seem to yield a clearer one, and taken together do give some idea of the intertribal marriage opportunities afforded members of some Australian tribes.

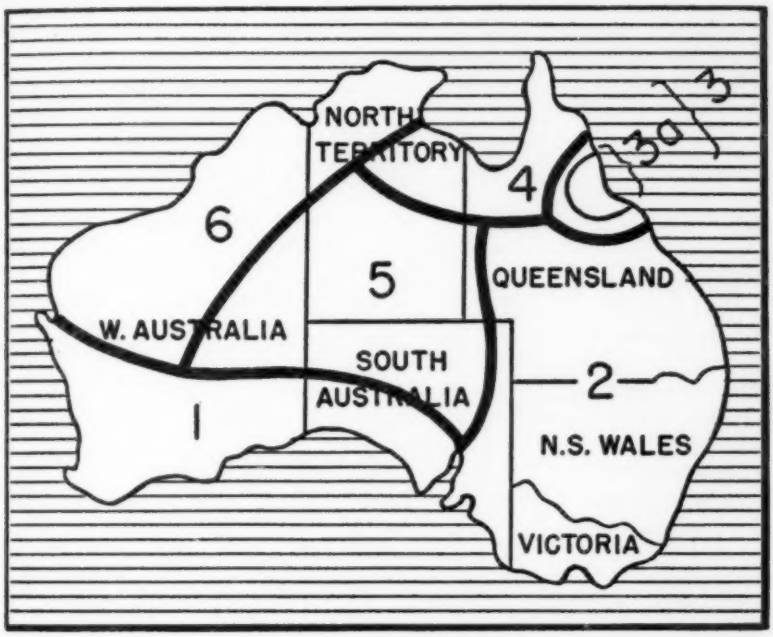

FIG. 1. SIX AREAS USED IN ANALYSING 1938-1939 DATA ON INTER-TRIBAL MARRIAGES.

Of the listed 101 marriages in the Negritic Block of Barrinean peoples as defined by Birdsell ('49) only one chanced to be contracted outside the Central Negritic Block and this between a Barbarian man and a Muluritji woman of one of the Semi-Negritic tribes whose territory joins his on a small segment of boundary.

In the Negritic plus adjoining Semi-Negritic tribe Blocks, of 150 marriages only one was outside the block and this was a marriage between a Wakaman man and a Kutjal woman (Carpentarian Block). Their tribal territories adjoin on a broad line.

Between the Carpentarian and South Eastern Australian Blocks, which do not join together over any large length of boundary, no intermarriages were recorded in a total of 180 marriages. Between the Carpentarian and Central Blocks also intermarriages were not recorded in 102 listed marriages. Since the usual intertribal marriage is between adjoining tribes or at most the next but one the lack of recorded marriages linking these blocks cannot be said to be very significant.

TABLE 2

Tribal and intertribal marriages

AREAS	TRIBAL MARRIAGES	EXTRA-TRIBAL MARRIAGES	ADJOINING TRIBES	ONE TRIBE REMOVED	TWO TRIBES REMOVED	% EXTRA-TRIBAL MARRIAGES
Whole of data	346	56	50	3	2	14
1 South Western tribes	80	10	10			11
2 South Eastern tribes	59	6	5	1		9
3 Negritic and adjoining tribes	119	31	27	2	2	21
3a Central Negritic tribes without adjoining tribes	81	20	18	1	1	20
4 Carpentarian tribes	80	7	7			8
5 Central tribes	8	2	2			20
6 North Western tribes	not sufficient data					

In the Central Australian Block, of 10 marriages, two were outside the area, one with the South Eastern and one with the South Western Blocks but the information available on these blocks in the Harvard-Adelaide University Anthropological Expedition results is largely for peripheral groups in Queensland and is insufficient alone to furnish sound data although it hints that the known trade routes running in a southwesterly direction through eastern Central Australia may have carried human genes as well as transmitting shell ornaments and stone-axe-blades.

To augment the scant data available for the Central area the following additional data fortunately are available.

TRIBAL AND INTERTRIBAL MARRIAGES—CENTRAL AUSTRALIAN DATA 1930-1932

The present writer, during the 6th, 7th and 8th Expeditions of the Board for Anthropological Research in 1930, 1931 and 1932 gathered data on tribal and intertribal marriages among 8 Central Australian tribes. The information came during the routine registration of the aborigines for the taking of anthropometric measurements.

All these tribes are in the "Central Tribes" area of the Harvard-Adelaide Expedition study, and give data for an area in which that series was weak.

TABLE 3

Tribal and intertribal marriages

CENTRAL TRIBES	TRIBAL MARRIAGES	EXTRA-TRIBAL MARRIAGES	ADJOINING TRIBE	ONE TRIBE REMOVED	TWO TRIBES REMOVED	% EXTRA-TRIBAL MARRIAGES
(a) Iliaura	34	3	3			8
(b) Anmatjera	26	5	4	(1 complex; see text)		16
(c) Aranda	4	3	3			data incomplete
(d) Walmala	30	2	1	1		6
(e) Jumu	3	2	2			data incomplete
(f) Kukatja	3	2		2		data incomplete
(g) Ngalia	16	2	2			11
(h) Pintubi	18	3	3			14
Whole of above	134	22	18	4 (one is complex).		14
Above (excluding Aranda, Jumu, and Kukatja three tribes with incomplete data)	124	15	13	2 (one is complex).		11
Groups speaking Aranda type language (a, b, c, d)	94	13	11	2 (one is complex).		12
Groups speaking Pitjandjara type languages (e, f, g, h)	40	9	7	2		18

The Ngalia listed here are in part the same subjects as appear in the first part of this study and represent an independently gathered set of data serving as a general cross-check on the results of that study.

The Iliaura listed in the above table form a compact tribal group whose only three extra-tribal marriages were with Aranda and these were confined to one Aranda family line, the Iliaura having supplied wives for at least two successive generations of one eastern Aranda family group. The data for the Iliaura are highly significant.

The Aranda data are not complete enough to be significant since some of the main groups are virtually extinct, and at the time of the study only marginal groups on the borders of other tribes were alive to speak.

For the Anmatjera the data are sound. One very interesting case was encountered where an old Anmatjera man was married to a woman who spoke Anmatjera, having been reared as one, but her parents had been Kukatja and Ngalia. This was an early intertribal marriage; it long antedates the main period of European contact. A further intertribal marriage occurred in the following generation in the same family line.

A rather different case is that of an Anmatjera man, now old, who in his youth left his tribe and lived as a Walmala. His wife in this case was an Aranda woman. Apparently he had stolen her, fled his country, and lived to rear a family. Kukatja and Aranda people and in later years and to a lesser extent the Anmatjera have been influenced by Hermannsburg Mission. Hence this case may not be as free of white man's influence as appears at first sight.

European contacts can be entirely ruled out as factors influencing the data for the Walmala, Jumu, Ngalia and Pintubi tribes since these tribes had only lately encountered white men, other than explorers, at the time the study was made.

One Pintubi intertribal marriage, with a woman of the Wenamba tribe, is of particular interest. People of the last named tribe live to the west of the Pintubi and were not (even in 1951) in known close contact with Europeans. When the data were being gathered the Pintubi themselves were not under any European influences. In actual fact not even the proper name of the Wenamba tribe was known till 1951.

One Pintubi intertribal marriage, with a Pitjandjara woman, appears to be a counterpart of the Pitjandjara exchange marriage with a Pintubi woman noted during the 1933 Expedition in the Mann Range. In that instance a Pitjandjara man was recorded as having obtained in marriage a Pintubi woman plus her "unwanted" store of wooden tjurunga, which it was her husband's duty to care for and secrete from

her. Both these alliances took place beyond any area of even remote European influences; any contacts they had had being confined to ephemeral ones during the passage of explorers through their country.

The data for the Jumu, being based on eastern marginal hordes only, is probably not fully representative. The two listed Jumu intertribal marriages are in successive generations and are connected, the circumstances being known. A Jumu man married a Ngalia woman. His son married a Kukatja. In this son's progeny there are thus represented Ngalia, Jumu and Kukatja genes. All the listed Jumu marriages can be regarded as free of European influences since the Jumu were much later than other tribes in coming into contact with Hermannsburg Mission. Incidentally, as showing the changes wrought by the impact of our white civilization, it is to be noted that one of the male descendants of the above "three-tribes-union" is now (1951) a cattle hand at Marree, living habitually 500 miles to the southeast of his father's country.

CONCLUSIONS

Drawing together the threads of the three groups of studies it seems evident that there are grounds for assuming that about 15% of Australian aboriginal marriages may transgress tribal boundaries and thus may introduce not only new genes but also new dialect and language forms, as well as any cultural items which have not chanced to spread more rapidly as the result of culture contact, copying and imitation.

The significance of such opportunities for slow and perhaps inexorable spread of human genes must be evident to all and may suggest that no primitive human group when in physical contact with another can remain to itself, unchanged, however conservative it may try to be. There is no inherent reason why, given time, any attribute associated with *Homo sapiens* may not spread to all.

One may recall that over the vastness of time represented by a "Mindel" or a "Riss Ice Age" or by a "Great Interglacial" the making of more than one type of *coup-de-poing* and blade implement seems to have spread from the tip of Africa to the top of Europe perhaps not once but several times. Doubtless human genes do the same, but more slowly.

A 15% intertribal marriage rate means a maximum gene flow of 7.5%. Since Australia is about 12 to 15 tribal areas wide in a north to south direction and 25 tribes long in an east to west direction the evident physical differences in various parts of the continent have not been affected very quickly.

ACKNOWLEDGMENTS

I am indebted to numerous colleagues on the various teams which have worked in the anthropometric field including: A. A. Abbie, J. B. Birdsell, T. D. Campbell, J. B. Cleland, H. K. Fry, the late H. Gray, C. J. Hackett, and the late T. H. Johnston. Various aspects of the problem have come up for discussion with them and for critical appraisal. Their view points often have provided the stimulus to thought and action in gathering the data given herein. However the work of gathering and assessing the data has been exclusively that of the writer who therefore is responsible for any errors it may contain.

SUMMARY

This paper arrives at the conclusion that among the Australian aborigines about 15% of marriages are intertribal. In a series of large blocks of tribes the percentages of recorded intertribal marriages range from about 7% to 21%.

On the available data the rate of intertribal marriages happens to be high (20%) within a block embracing the Atherton Tableland in Queensland, where the Barrinean (Tasmanoid or Negritoid) peoples predominate. It is much lower (about 10%) among the Southern coastal tribes of typically Murrayian stock and is around 15% over much of Central Australia although in the Ngalia tribal area, studied in greatest detail, it stands lower (at about 8%). For the Carpentarian areas of the North relatively meager data implies intertribal marriages of the order of 8%.

Evidence is offered for the general validity of the data presented and the conclusions reached.

The data as a whole are based on analyses of about 760 marriages among fullbloods where the accompanying information indicated the probability that the marriage was free from disruptive European influences.

Physical anthropologists working on genetics need information on the factors influencing human population structure. The hunting and food gathering people of Australia tend to live in tribal units with breeding communities of the general order of 150 to 600 individuals. Populations of this size seem sufficiently small to suggest the possibilities of the occurrence of random genetic drift, which may be presumed to occur if the rates of selection are not too high and if the

rate of gene exchange between the breeding communities is low. It would seem important therefore to understand the degree of intergroup contact that may exist among the various tribes.

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APPENDIX

LIST OF TRIBAL AND INTERTRIBAL MARRIAGES, AS RECORDED BY HARVARD-ADELAIDE UNIVERSITIES ANTHROPOLOGICAL EXPEDITION.

TRIBE	TRIBAL MARRIAGES	INTERTRIBAL MARRIAGES
1 SOUTH WESTERN TRIBES		
Wudjari	6	
Minang	2	
Koreng	1	
Kalamai	6	
Widi	1	
Ngaluma	1	
Kalarko	1	
Ngadjunma	11	1 Mirning (adjoining tribe) 1 Kalarko (adjoining tribe) 1 Tjeraridjal (adjoining tribe)
Waljen	1	
Murunitja	1	
Tjeraridjal	2	1 Ngadjunma (adjoining tribe)
Wirangu	4	
Mirning	5	
Tjalkadjara	1	1 Nangatadjara (adjoining tribe) (linked in with pushing of Tjalkadjara tribe westwards from Darlot c 1880-90 by Nangatadjara)
Nangatadjara	14	1 Wongaii (adjoining tribe) 2 Mandjindja in successive generations; both prior to European influence (adjoining tribes)
Mandjindja	9	1 Nangatadjara (adjoining tribe)
Ngadadjara	7	
Ngalea	1	
Kokata	6	1 Ngalea (adjoining tribe)

TRIBE	TRIBAL MARRIAGES	INTERTRIBAL MARRIAGES
2 South Eastern Tribes		
Dainggata	1	
Kumbainggiri	1	
Kunggari	14	1 Mandandanji (adjoining tribe)
Koamu	3	
Batjala	2	
Korenggoreng	3	
Kangulu	3	
Ngoera		1 Wakawaka (adjoining tribe)
Darambal	1	
Wakawaka	3	
Kabikabi	1	
Pitjara	1	
Kairi		1 Wadja (separated by 1 tribe, the Kangulu)
Ngaro	2	
Wiri	4	1 Jangga (adjoining tribe) 2 Biria (adjoining tribe)
Biria	1	
Kutjala	1	
Barada	3	
Jirandali	1	
Kalali	4	
Kalkadung	4	
Ringu ringu	1	
Maljangapa	1	
Marukanji	1	
Karuwali	1	
Kuungkari	1	
Koa	1	
3 Negritic and Adjoining Tribes		
Wulgurukaba	2	
Warkamai	7	
Keramai	9	3 Gulngai (adjoining tribe) Warkamai (adjoining tribe)
Nawagi	3	1 Mamu (not contiguous tribes but both rain-forest peoples) 2 Djiru (adjoining island tribe)
Djirubal	7	1 Ngatjan (adjoining tribe) 4 Gulngai (adjoining tribe)
Ngatjan	4	5 Djirubal, Mamu, Idindji (all adjoining tribes)
Mamu	9	2 Idindji, Gulngai (adjonining tribes)
Gulngai	4	1 Djirubal (adjoining tribe)

TRIBE	TRIBAL MARRIAGES	INTERTRIBAL MARRIAGES
Djiru	3	2 Mamu adjoining and Idindji not contiguous (periods 1890-1895)
Idindji	12	2 Ngatjan (adjoining tribe)
		1 Djirubal (separated by Ngatjan tribe)
Wanjuru	2	
Kongkandji	15	
Tjapukai	17	1 Buluwai (adjoining tribe)
Buluwai	2	
Barbaram	6	1 Muluritji (adjoining tribe, linked on small segment of boundary)
Irukandji		1 Tjapukai (adjoining tribe)
Kokobididji	1	1 Jungkurara (adjoining tribe)
Agwamin	2	1 Barbaram (not adjoining tribe, separated by Wakaman tribe)
Kokojelandji	3	
Muluritji	7	1 Walpura (adjoining tribe)
		1 Tjapukai (adjoining tribe) fathers's father was of mixed Muluritji X Tjapukai origin
Kokobujundji	1	
Walpura	1	
Wakaman	2	1 Kutjal (adjoining tribe)
4 CARPENTARIAN TRIBES		
Koko Imudji	8	
Koko Jawa	2	
Bakanambia	2	
Wanji	6	1 Maikudung (adjoining tribe)
Ngaun	4	
Kukatji	2	
Jokula	3	
Maikudung	2	
Karawa	1	
Lardiil	1	
Kokomini	5	
Tagalag	3	
Walagama	2	2 Maikulung (adjoining tribe)
Araba	1	
Kunggara	9	
Konanin	4	
Wikmunkan	1	
Wikngatara		1 Wikmunkan (adjoining tribe)
Ombila	3	1 Kandju (adjoining tribe)
Kandju	13	2 Ombila and Aijabatha (adjoining tribes)

TRIBE	TRIBAL MARRIAGES	INTERTRIBAL MARRIAGES
Ankamuti	1	
Winduwinda	2	
Pakadji	1	
Ngundjan	3	
Olkulo	1	
5 CENTRAL TRIBES		
Pitjandjara	1	1 Ngadadjara (adjoining tribe)
Waramanga	1	
Jangkundjara	1	
Antakirinja	1	
Aranda	2	
Wakaia	1	1 Kalkadung (adjoining tribe with very limited common boundary)
Ngalia	1	
6 NORTH WESTERN TRIBES		
Njikena	1	

DEMOGRAPHIC PATTERNS IN THE PAPAGO INDIAN VILLAGE OF CHUICHU, ARIZONA

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INTRODUCTION

DURING the summer of 1952 an ecological study was conducted in the village of Chuichu, Arizona, a community of 223 inhabitants situated some 60 miles south of Phoenix on the northern edge of the Papago Indian reservation. Since the demographic material seemed to have intrinsic value, it is presented here for comparative purposes. Where feasible, statistical tests have been applied; where not, the findings are presented as they stand for use by those concerned with groups of similar size.

VILLAGE POPULATION

The most accurate count of Papagos living on reservations was made in 1942 when war ration books were issued. At that time 6,494 were enumerated. In 1910 and 1930, the Bureau of the Census listed 3,798 and 5,205 respectively. The most recent estimate of 7,377, as of 1950, comes from House Report No. 2503 (82nd Congress, 2nd Session, '52). These 4 figures over the past 40 years indicate a 98% tribal increase, or an annual rate of about 1.7%.

For the village of Chuichu, the 1942 ration count revealed 136, although the proportion of the total year these people actually lived in the village is not known. In 1952, the writer counted 223 people all of whom had been residents for 6 months or more of the preceding year. Of the 48 married couples making up this population, 26 had spent the entire time at home, 15 had been employed away from the village for one to three months, and 7 had had outside employment from 4 to 6 months.

The federal census defines the family as two or more persons related

by blood, marriage, or adoption residing together; and the primary family as the head of household together with all others in the house related to him. Since no unrelated persons were living in any household in Chuichu either in 1942 or in 1952, the words "family," "primary family," and "household," can be used interchangeably. In 1942, 6 households contained widowed grandparents, and 5 contained related persons other than sons, daughters, and their children. In 1952, widowed grandparents were present in two households other than their own, while 5 households contained relatives other than sons, daughters, and their children. Blood relationships and marriage connections from household to household were quite similar, unlike the varied character of household composition found by Beaglehole ('35) in 1934 census data from two comparably-sized Hopi Indian villages.[1] There has also been a growing tendency for Papago households to contain only two generations rather than the traditional three, a trend noted by Joseph, Spicer, and Chesky ('49) in certain other parts of the reservation.

With the 1942 and 1952 population figures as a basis, some indication of the demographic situation in Chuichu is possible. During the decade, the rapid growth of the village stands out. Fifty-two people have migrated from other communities:

new households (6)	36
new wives	8
new husbands	3
divorced woman and son	2
grandmother	1
orphaned niece	1
adult daughter	1
	52

Including the offspring of these new families since their immigration, 69 children have been born since 1942, making the total gross population increase 121. Over these same years, there have been 29 deaths and 5 emigrations. Thus, the net increase has been 87, or 64%, an average increase per annum of 5.2%. Part of this increase is a reflection of a high number of recent marriages. Between 1942 and 1950 there were 5, and since 1950 there have been 7. All but one of these unions brought a new individual to Chuichu.

[1] Hopi social structure is oriented in the female line. Typically, husbands reside in the household circle of the wife's family. The opposite is generally true in Papago society.

Within the village itself, there have been 56 known changes of residence and undoubtedly more have occurred. These shifts have been brought about by parents leaving their children in a relative's care while they left Chuichu for wage work, by periodic reshuffling of households to meet space and living problems, by three divorces, and one new marriage within the village.

In 1942, there were 32 households, averaging 4.25 persons per house. In the ensuing 10 years, 5 of these units dissolved, but 15 new ones were created so that 42 existed in 1952, averaging 5.31 persons each. The size of household at present is almost identical with the tribal estimate of 5.3 made by the Secretary of the Interior in 1949, but biological family size is smaller: 4.1. Of the 27 households intact throughout the period, 5 declined in size, 5 remained stationary, and 17 increased. At the present time there is a concentration around the number of 5 per household. Individual homes range in size from one to 13, but only 7 contained more than 7 people, and only 6 contained less than three.[2]

Whereas the birth dates of the children born since 1942 are known, the death dates of those dying between 1942 and 1950 are unknown. Thus, crude birth and death rates must rest partly on estimation. The 1942 population, less emigration since that year, reveals 131 people who have lived in Chuichu continuously between 1942 and 1950. To this group 31 children were born, and of it 16 died, making the net increase 15. With this information, birth and death rates have been computed in table 1 for the 7-year period, 1942-1949, and for the three-year period, 1950-1952, during which time both birth and death dates were known.

TABLE 1

Crude birth and death rates

YEAR	VILLAGE POPULATION	NO. OF BIRTHS	BIRTH RATE PER 1000	NO. OF DEATHS	DEATH RATE PER 1000
1942-1949 (average)	131	4.4	33.8	2.3	17.6
1950-1952 (average)	201	6.7	33.3	3.0	14.4
Tribal rate (1942)			42.3		32.3
U. S. rate (1950)			23.5		9.6

[2] In Beaglehole's census among the Hopi in 1934, household size was considerably larger (6.5), and there was little concentration in the size of individual households.

From the foregoing, it will be seen that both birth and death rates for the village are lower than for the tribe, and that the death rate especially is moving away from any similarity. Whether the tribal pattern in the last 10 years has changed in like manner is not known.

It is not possible with the information available to determine life expectancy in the village. For the tribe, based on an estimation of the number of infants born and the proportion still living at later ages, life expectancy in 1942 was considered to be 17 years (Department of the Interior, '49). Infant and child mortality are recognized to be high, and if the total number of deaths of infants in the first few weeks of life were accurately known, the life span might have been even lower. In Chuichu, the average age at death in the past 10 years was 37.7 years, but there is lack of concentration around this figure. If the Papago survives adolescence, he is likely to live a good long time. In fact, the number of old people is remarkably high. Six of the deaths in the village in the last 10 years were of people presumably over 80. Now present in Chuichu are 13 people who are probably at least 70 years of age. Deaths in the middle years appear to be heavier for men than for women partly the result of accidents incident to occupation.

TABLE 2

Ages at death (1942-1952)

AGE	NO.	PER CENT
under 5	9	31.0
5– 9	2	6.9
10–14	2	6.9
15–19	2	6.9
20–65	3	10.4
over 65	11	37.9

Another peculiarity in the birth and death pattern in the village has been the prevailing sex ratio. The small sample and the lack of information on deaths in the early stages of post-natal life make the sex variance of little significance but of enough interest to suggest further investigation on a wider scale.

The village comprises quite a young group although the fertility rate appears to be dropping.

TABLE 3

Sex ratio of births and deaths
(figures based on table 1)

		MALE	FEMALE
Births:	(1942-1949)	15	16
	(1950-1952)	8	12
Child deaths	(1942-1949)	1	4
under 5:	(1950-1952)	0	4
All deaths:	(1942-1949)	4	12
	(1950-1952)	2	7

TABLE 4

Fertility rates

	WOMEN (15-49)	CHILDREN (UNDER 5)	FERTILITY RATE (PER CENT)
Chuichu (1952)	60	31	51.7
Chuichu (1942)	35	19	54.3
Tribe (1942)	1,481	863	58.3
U. S. (1950)[1]	38,552	16,324	42.3

[1] Preliminary estimate (in thousands)

TABLE 5

Population by age groups (in per cent)

AGE	VILLAGE 1952	VILLAGE 1942	TRIBE 1942	UNITED STATES 1950
0–19	47.9	38.5	46.5	34.4
20–39	26.0	37.8	29.9	30.6
40–59	17.8	10.4	13.8	22.9
60–over	8.3	13.3	9.8	12.1
	100.0	100.0	100.0	100.0

The age distribution of the 1952 Chuichu population follows the tribal pattern quite closely, but both groups are different from the village in 1942 and from the present distribution for the United States as a whole.

On the basis of the distribution in the above age groupings for the United States in 1950 and 1940, expected frequencies were computed. These were compared with the village and tribal observations, and the Chi-square test applied. For the groups as a whole for three degrees of freedom, the values for both tribe and village (1942 and 1952) are significant at the one per cent level. Combining the cases for the village in the two census years and repeating the test revealed significant variance in the two samples at the two per cent level. Although the 1952 village was not found to be significantly different from the tribe, the 1942 village is significant at the 5% level. An attempt was also made to ascertain if the current age distribution of the tribe and village matched any past U. S. census year between 1850 and 1950. For the village in 1952 and for the tribe, the closest resemblances occurred with 1880 through 1910.[3] No causes for this were established, but certain factors in the U. S. population such as the inclusion of former slaves with the white population after 1860 and high immigration during those years may have some bearing. The 1942 village distribution showed no discernible pattern compared with past U. S. census years.

The median age in Chuichu has been dropping and, in 1952, corresponded to the United States median of 1890.

TABLE 6

Median age

YEAR	VILLAGE	TRIBE	UNITED STATES
1952	21.0	——	30.1 (1950)
1942	26.5	22.1	28.9 (1940)

As in the U. S. population, the median age for males in both village and tribe is slightly higher than for females. Due to the long span of life of many of the villagers, once adolescence is survived, mean age is closer to the present United States mean than to the median.

[3] Although the village values were not significantly different from total United States figures for these years, tribal values were still significant at the one per cent level, and the village and tribe followed trends similar to each other.

The sex ratio by broad age groupings, particularly for the village, tends to reverse the pattern prevailing in the U. S. as a whole. Among those under 40, females outnumber males, but over 40 the opposite is true.

TABLE 7

Mean age

YEAR	VILLAGE	TRIBE	UNITED STATES
1952	26.9	——	31.1 (1950)
1942	28.8	26.3	29.6 (1940)

TABLE 8

Sex ratio by age groups (in per cent)

AGE	VILLAGE 1952		VILLAGE 1942		TRIBE 1942		UNITED STATES 1950	
	Male	Female	Male	Female	Male	Female	Male	Female
0–19	48.6	51.4	50.0	50.0	49.2	50.8	50.5	49.5
20–39	42.1	57.9	47.1	52.9	50.1	49.9	48.9	51.1
40–59	56.4	43.6	64.3	35.7	53.5	46.5	49.8	50.2
60–over	61.1	38.9	50.0	50.0	57.3	42.7	47.8	52.2

Again on the basis of the sex divisions in each age group for the United States in 1950 and 1940, expected frequencies were computed and compared with the observed in both the village and tribe. The Chi-square test was then made. For the groups as a whole for 4 degrees of freedom, the values for the tribe were significant at the one per cent level. The values for the village in both 1952 and 1942, however, fell short of the 5% level. As with age distribution, the tribal sex division most closely matched the U. S. in the census years 1880 through 1910, but the values were still significant at the 5% level. On the other hand, village sex division followed no pattern of close resemblance to any past U. S. census year, but the values were not significant.

Broken down by size of biological family, the village sample becomes exceedingly small, but if the figures are indicative, the average family size is surprisingly low, weighted in part by the large proportion of recent marriages. In only 5 families were there 5 or more children living with their parents, the highest number being 7. The figures, however, may not represent all children under 21 since some may have been living with relatives away from the village. In the case of some

families, there are gaps of as much as 10 years between the ages of children, indicating high mortality in the early years of life.

TABLE 9

Size of family

CHILDREN UNDER 21	1942 FAMILIES		1942 FAMILIES PRESENT IN 1952		ALL 1952 FAMILIES	
	No.	%	No.	%	No.	%
none	8	25.0	8	27.6	12	25.0
1	7	21.9	3	10.3	12	25.0
2	12	37.5	5	17.2	6	12.5
3	5	15.6	3	10.3	5	10.4
4			6	20.6	8	16.6
5			1	3.5	1	2.1
6			2	7.0	3	6.3
7			1	3.5	1	2.1
	32	100.0	29	100.0	48	100.0

Marriage is the normal state for adult Papagos, but Chuichu appears to have a relatively high proportion of unattached people. Of those 21 or over, 20.2% were unattached in 1952.

	Male	*Female*
Single (21 or over)	4	8
Divorced	1	4
Widowed (all over 50)	3	2

The reliability of the birth dates of the Chuichu population should be mentioned. Although Papagos are familiar with relative ages since kinship terms and behavior patterns have been linked to them (Joseph, Spicer, and Chesky, '49), exact ages have had little cultural significance. Now, of course, under the influence of school rolls, the war, census taking, and old-age benefits, the knowledge of proper ages has become useful and necessary for these people. In Chuichu the transition is well along, but it will be at least another generation before birth dates become accurately known for all ages. When ration books were issued in 1942, the government made an effort to determine birth dates. In the summer of 1952, the writer checked school rolls and questioned people as to their ages. With these various sources of information, some check on age accuracy was possible. If age checked in two or more cases, it was considered correct.

TABLE 10

Age accuracy

AGE	CORRECT	INCORRECT	DON'T KNOW [1]
under 21	110	2	0
21–39	12	23	15
40–over	13	32	14
Don't know [1]	0	0	2

[1] "Don't know" means that only one or no sources of information were available.

From the preceding, it can be seen that by far the greatest accuracy prevails among those under 21 years of age. Of those apparently misstating their ages, where recheck was possible, the standard deviation of the distribution of misstatements was 4.25 years, with a mean of —.035 of a year.

DISCUSSION

There is no doubt that more people are now residing in the village than at any time in recent years. To a large extent, the influx from outside areas and the high proportion of new marriages can be accounted for by improved economic conditions. Favorable underground water supply for irrigation farming, successful cotton crops harvested cooperatively in the past several years, increased income from rental of pastures, and the convenient location of the village to surrounding Arizona farms where wage work can be secured, have all helped to give Chuichu a new reputation as a promising place in which to live.

The long-standing migratory pattern of Papagos, however, may mean that this relatively large population increase is only temporary. Families who have come from surrounding communities undoubtedly hold land and may still continue to graze cattle near their former homes; but the fact that these families, who have swelled Chuichu nearly 25%, hold only 5% of the local land, seems to indicate that the possibility of a higher standard of living has drawn them there. On the other hand, all of the new families in the village are closely related in some way to the existing population. Unrelated people still do not move easily into a Papago village, nor do those in a village readily leave. Thus, the factor of close inter-family relationship may act as a check on future immigration unless it is outweighed by a continuation of the recent economic improvements.

The birth rate in Chuichu has been somewhat below that for the tribe and appears to have remained quite steady over the past decade. A slightly higher proportion of families in 1952 had less than two children than was the case 10 years earlier but, at the same time, a considerably higher proportion of 1952 families were biologically uncompleted.

Noteworthy is the relatively low death rate that prevails. Clean water from pumped sources since 1923 has undoubtedly given Chuichu a health position superior to that of many Papago villages where pumped water is either a more recent development or is much less accessible for daily needs. The medicine man's art is dying out in most Papago villages and is not in evidence in Chuichu. Although modern medicine is not fully accepted or sought by the residents, an increasing number of families are using the facilities in Casa Grande, less than 10 miles away. Principally due to increasing changes for longer life, natural increase has gone up.

TABLE 11

Natural increase

	PER CENT
Chuichu (1950-1952 average)	18.9
Chuichu (1942-1949 average)	16.2
Tribe (1942)	10.0

In respect to age distribution and sex division, both the tribe and village comprise groups rather different from the present U. S. population according to the computed values of Chi-square. Moreover, in age distribution, the village itself has changed significantly since 1942. In the past, the physical environment of the Papagos has been relatively isolated. Each community has tended to be a natural, closely-knit unit indulging in comparatively little communication with other communities except the very closest ones. Now, with better roads, more facilities for communication, more interest and concern for both tribal and federal government at Sells, in the heart of the main reservation, and with less isolation between Papagos and Arizona society at large, village social patterns are changing. In Chuichu, at least, these changes are being reflected in the population make-up. Indicative is the fact that 19 of the present spouses in the village are from outside communities, 5 of them having made their original homes more than 50 miles away. Of these outside marriages, 60% have occurred in the last decade.

Past records are scanty, but indications are that the Chuichu demographic pattern was following its own rather unique and stable course as recently as 1942. But with important social and economic changes since the war, and especially if land improvement plans for this area take place in the near future (Department of the Interior, '49), it is likely that population characteristics will continue to show marked changes but tend to become more rather than less like the nation's population as a whole.

SUMMARY

The Papago village of Chuichu, Arizona, in the past decade reveals a per annum population increase of 5.2%. In these same years, the birth rate has remained steady, but the death rate has dropped appreciably and length of life has increased. For the Papago tribe as a whole in 1942, and for Chuichu in 1952, age distribution is shown to be significantly at variance with present U. S. distribution. Age groupings within the village, itself, have also changed significantly in the last 10 years. Sex divisions by age groupings for the tribe are unlike the U. S. but statistically this is not significant for the village.

ACKNOWLEDGMENTS

Appreciation is expressed to Professor G. Evelyn Hutchinson, Department of Zoology, and to Professor Paul B. Sears, Chairman of the Conservation Program, Yale University, for their advice and criticisms in the preparation of this article. The ecological study, of which this paper is a part, was made possible by a grant from the Higgins Trust, School of Graduate Studies, Yale University.

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NOTE ON THE FERTILITY OF A NUMBER OF WOMEN OF THE ANCIENT NEAR EAST

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INTRODUCTION

IN the course of other research, the following material on the fertility of women of the Bible and the Apocrypha was assembled. Data were also found for a number of Macedonian, Seleucid, and Ptolemaic queens.

There are few cases in the Bible and the Apocrypha in which we know the total number of sons and daughters of a woman, but in several instances we have a fair assurance of how many sons she had. The following data, therefore, are given in number of sons.

DISCUSSION

In the 2,000 years covered by the Bible from the time of Abraham in 1900 B. C. to the destruction of Jerusalem and the martyrdom of Paul in the 1st century A. D., we can count 43 women who had a total of 119 sons. The average number of sons per woman is 2.8. If we compare this with the number of sons of a Palestinian woman in the century between 1830 and 1930 A. D., we find some difference.

Hilma Granqvist's study made in the village of Artās, south of Bethlehem, between 1925 and 1931 gives the genealogies of all the families of the village for 4 generations (Granqvist '31). Because polygyny is still practiced and because the genealogies are traced through the male line, counting the number of sons per woman has not always been possible. (The number of daughters is not given.) However, we can tell from these charts the number of wives in each household and thus determine the average number of children for the total number of women.

Only those women who were dead were considered in order to be sure that their families were completed. The count showed that 60 Artās women had 95 sons or an average of 1.6 sons per woman. These women, then, had one son less than the average Biblical woman.

By restricting the count to the 29 monogamous families of Artās, it was possible to determine the number of sons that each woman had. Twenty-nine monogamous women had 48 sons—that is slightly over 1.6 sons per woman.

Table 1 shows that the highest percentage of Biblical women fall in

TABLE 1

Number of sons of 43 Biblical women, 29 monogamous Artās women, and 34 Macedonian, Seleucid, and Ptolemaic Queens.

NUMBER OF SONS	BIBLICAL		ARTĀS		MACEDONIAN, SELEUCID AND PTOLEMAIC QUEENS	
	Number of women	Per cent	Number of women	Per cent	Number of women	Per cent
0	4	9.3	6	20.7	6	17.7
1	7	16.3	10	34.4	7	20.6
2	11	25.8	6	20.7	13	38.2
3	9	20.9	4	13.8	5	14.7
4	4	9.3	1	3.5	2	5.9
5	3	6.9	2	6.9	1	2.9
6	3	6.9	—	—	—	—
7	2	4.6	—	—	—	—
Totals	43	100.0	29	100.0	34	100.0

the two and three son brackets. In the Palestinian village, however, the greatest proportion of women is found in the lower brackets of zero sons, one son, and two sons. The number having one son is markedly high.

Table 1 also gives the fertility of a number of women who ruled in the Macedonian, Seleucid, and Ptolemaic empires from the 5th to the 1st centuries B. C. (Macurdy '32).

In all, there are 34 women with 61 sons and 34 daughters. Again we shall refer only to sons because the number of daughters is uncertain.

The average number of sons of these Hellenistic women is approximately 1.8, or one son less than that of the Biblical women. This figure is not far from the number of sons of the modern Palestinian women, which averaged 1.6. Table 1 shows the family size of the Hellenistic

women, which appears to be intermediate between that of the Biblical women and the modern Palestinian women.

Six of the Ptolemaic queens, whose fertility we know about, were married to their brothers, but they do not appear to have been less fertile than the other queens. The possibility of infants being brought up in the palace as the queen's children in the absence of true heirs cannot be discounted as a possibility, however. It is doubtful whether the queens had a characteristic fertility considering the violence and extraordinary conditions of their lives, and unfortunately no material was found which would give the fertility of another group of Hellenistic women, or even of modern Greek or Egyptian peasant women.

CONCLUSION

Although the historical data are too fragmentary to reveal very much about fertility in the ancient Near East, it appears that the fertility of women of the Bible and Apocrypha was higher than that of more modern women living in the same area. Those Macedonian, Seleucid, and Ptolemaic queens for whom we have a record of offspring show a fertility between that of the ancient and modern Palestinian women.

ACKNOWLEDGMENT

The generous help and encouragement of Professor G. Evelyn Hutchinson, Osborn Zoological Laboratory, Yale University, has made this study possible.

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THE SOCIAL BIOLOGY OF VERY HIGH FERTILITY AMONG THE HUTTERITES
THE DEMOGRAPHY OF A UNIQUE POPULATION

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INTRODUCTION

THE ethnic Hutterites of North America provide an exceptional opportunity to study social and biological aspects of human fertility and reproduction. It is well known that in technologically advanced countries, where population statistics are adequate, the population does not increase under sufficiently stable and unplanned conditions to use demographic data as an ex post facto experiment in human biology. In groups where there is little migration, where no birth-control measures are used and where reproduction proceeds without conscious planning, vital statistics are usually unreliable. Hutterite vital statistics are an exception to this generalization.

The group is an anabaptist religious sect, living in the United States and Canada in small self-contained hamlets, which they call colonies. Within each colony, and throughout the entire population, there is a high degree of homogeneity in socio-economic status, educational level and other social attributes. Between 1880 and 1950 the sect has increased over 19 times, from 443 to 8,542 persons. This growth has largely been the result of natural increase. Excellent records are available covering more than the last 70 years of the group's history. During this 70 year period, fertility patterns through time could be observed almost entirely unaffected by some of the common social factors as migration, birth-control practices and changing marriage patterns.

The Hutterite population is reproducing itself close to the theoretical

maximum level of human fertility for all but the 15-19 year age group. To some extent the biological and social factors in human population growth can be observed separately.

The vital statistics were obtained in the process of a general culture-personality study.[1] The research was not planned primarily for demographic purposes. It was designed, as its title indicates, to explore the "Cultural and Psychiatric factors in the Social Life of the Hutterites." Extensive demographic information was collected for ancillary purposes. It was needed to make an adequate description of the group and to calculate rates of mental disorders. Complete censuses of the entire population were available for June 1880 and December 31, 1950. For the intervening years there were 9 population estimates. Family records for 80% of the population in 1950 were the basis of the detailed fertility data. Many internal checks could be made to test the accuracy and representativeness of these records, which are kept by the preacher of each colony as well as by the head of each family in the "Family Bible."

POPULATION GROWTH

The 1880 Base Line

Census taking in this country is a constitutional requirement to provide for a decennial reapportionment of congressional representatives and direct taxes on a population basis (Constitution of the United States, Article I, Section 2, 1789). In the hot summer weather of June in 1880, census enumerators rode across the recently settled plains of the Dakota Territory to gather information for the tenth official census of the United States. In contrast to previous censuses, made during the first century of the Republic, the census of 1880 incorporated requirements to train the enumerators to achieve greater accuracy. It was more adequate technically than the previous American censuses (Wright, '00).

Since 1870, the date of the previous enumeration, the Dakota plains had received many pioneer immigrants. Among them were almost all the Hutterites of the world. This protestant sect had its origin in Switzerland and Bohemia in 1528. Its leaders were among the most prolific writers of religious tracts of the reformation period. At the

[1] The general plan of the study was reported by Eaton, Weil and Kaplan ('51). The first final report of some of the findings has been completed and is scheduled for publication in the Spring of 1954 by the Free Press with the title of *Culture and Mental Disorders*.

end of the sixteenth century the group was estimated to have 12,000 to 15,000 adherants (Horsch, '31). During the next two centuries they were severely persecuted by both Catholic and Protestant rulers. By 1762 the sect was nearly exterminated. Only about 60 of the faithful survived to find refuge in Russia under the religiously tolerant regime of Catherine the Great.

Between 1874 and 1877, practically all Hutterites, afraid of renewed religious persecution, left Russia where they had been living in three Crimean villages (Zieglschmid, '47). They settled in south-eastern South Dakota. Some of them took advantage of the Homestead Act to acquire free land. Others, estimated at somewhat less than half of their total number, bought large tracts of land to build 4 hamlets, each of which was organized on a communal basis. They were the orthodox branch of the sect. They wanted to live up to one of the basic precepts of their religion which regards all private property as sinful.

We could not help but be impressed by the fact that science is a cumulative product, as we checked over photostatic copies of the fading, neatly penned census records. Census agents Charles McCollum, John R. Maxwell and Miles T. Wolley called on these small cohesive groups, the ancestors of all contemporary colony Hutterites in the United States and Canada. The conscientious work of these officials, now long dead, greatly increased the opportunities for verifying our findings. They enumerated 443 colony Hutterites. Their records furnish the name, age, sex, race, occupation, place of birth and place of residence. The distinctive features of the group seemed to have impressed the census takers. Several times they went beyond their instructions to record: "This group speaks, reads and writes the original German language." or "Here ends the Elmspring (or Wolf-Creek) Russian Mennonite Colony." The accurateness of their reports has been verified against complete population data on many of these families found in Hutterite family bibles and colony records.

Our enumeration of Hutterites was also facilitated by the distinctive patronyms of the group and their almost uniform pattern of assigning first names and middle initials. The first son is usually named after the father, the first daughter after the mother; all children use the initial of their mother's name. Seventy percent of the 443 colony Hutterites in 1880 had one of 5 names: Hofer, Waldner, Stahl, Walter or Wipf. Ten other patronyms accounted for the remainder of the group.[2]

[2] Kleinsasser, Wurz, Gross, Entz, Wollman, Mandel, Decker, Knels, Glanzer

The accuracy of the enumeration process, which underlies our demographic data, can be illustrated by showing how it was possible to identify the Tripp Colony in the 1880 census, although it was not referred to by this name by the census taker.

From Hutterite records, we knew that there was a small settlement near Tripp, South Dakota, settled for a few seasons by members of the Bon Homme Society. Unfortunately, the exact location of this colony or the identity of its members was unknown. As a result, these people had probably not been included in any of the estimates of the population of Hutterite colonies made by previous writers.[3]

We knew from Hutterite records that the spiritual head of the "Hutterische Society, Bon Homme County" was a Reverend Michel Waldner. He was not found to be registered there when we examined the 1880 census microfilms. The question therefore arose: Where was this patriarch on the enumeration date, the 16th of June, 1880? Why was he excluded from the census record of his flock?

His name appeared later as we looked at a page in the census microfilm of Hutchinson County. He was not identified as a preacher, but as a farmer. All Hutterite preachers have some other occupation. However, his birthdate and those of his family checked completely with those recorded in the Bon Homme church register. He was listed with ten other farmers as living in *one* dwelling house. All had Hutterite names. Most of them were on lists in our files, which had been obtained from various Hutterite records.

The data contained in the 1880 census permitted us in turn to address specific questions to contemporary Hutterites, resulting in nearly complete clarification of the identity of the ancestors of the entire 1950 population.

The names and location of the four colonies in existence in 1880 are shown in table 1; their population by age and sex are given in

and Jensen. There were no families with the last name of Jensen in 1950, because the lone family in 1880 had no sons to perpetuate the patronym. There were however, many families named Tschetter, descendants of three large families who joined the colony Hutterites between 1883 and 1892.

[3] There are several published estimates of the population of the original Hutterite colonies in North America. They vary from 250 to 350. See Hofer ('46); Arndt ('44); Deets ('39); and Horsch ('31). The estimates, although based on partial reports, were usually quite accurate for the segment of the population to which they applied. Until recently, when the 1880 census was made available to us, there was no way of checking the accuracy of these estimates.

table 2. The following demographic characteristics should be noted, although the total number of persons in each of the age groups is small.

TABLE 1

List of Hutterite Colonies in June 1880 [1]

NAME OF COLONY	YEAR OF SETTLEMENT	LOCATION	POPULATION JUNE 1880	KINSHIP GROUP [2]
Bon Homme	1874	Bon Homme County, Township 93, Range 59	139	Schmiedenleut
Tripp	1879	Hutchinson County, Township 97, Range 60	55	Schmiedenleut
Old Elm Spring	1877	Hutchinson County, Township 100, Range 59	112	Lehrerleut
Wolf Creek	1874	Armstrong County,[3] Township 99, Range 57	137	Dariusleut
All Colony Hutterites	1874 to 1879	Southeastern South Dakota	443	

[1] From the 1880 census. Photostatic copies of the original records were made available by the U. S. Census Bureau.

[2] Contemporary Hutterites are composed of three kinship groups, each with considerable in-group consciousness. They have their origin in the population of the first settlements, each of which organized separate branch colonies as they grew in numbers.

[3] Armstrong County is now incorporated in Hutchinson County.

These same characteristics will be found to re-occur with little variation at later periods.

1. The number of males and females are nearly equal (221 to 222). The Hutterites migrated to the United States as complete communities, taking all family members with them. In this respect they differed from many other immigrant groups, who left the old folks in the homeland and where male immigrants tended to exceed females.
2. Males outnumber females in all age groups over 40.

3. Nearly half of the population is under 15 (47%) and 12 persons (2.7%) are over 65 years of age.

The 1950 Benchmark

A complete enumeration of the Hutterite population is also available for December 31, 1950. Official 1950 federal census records are not open for inspection. Census records have been classified as secret since the year 1900, when the present United States Bureau of the Census was organized. Summary population data on the Hutterites could be obtained

TABLE 2

Distribution of the Hutterite Population by Age and Sex June 1880

AGE	MALE	FEMALE	TOTAL
Under 15	109	103	212
15–19	23	21	44
20–24	15	24	39
25–29	15	15	30
30–34	13	15	28
35–39	6	16	22
40–44	10	7	17
45–49	11	4	15
50–54	2	3	5
55–59	3	7	10
60–64	6	3	9
65–69	5	4	9
70–74	1	0	1
75–79	1	0	1
80–84	1	0	1
Total	221	222	443

for the Canadian colonies, but they were outdated and not sufficiently detailed to be adequate for our purpose. The vital statistics needed by the Hutterite Mental Health Study therefore, had to be obtained by making a census of our own, in cooperation with the Hutterites and their elected leaders. The field workers were able to travel in cars which were considerably faster than the horses used by our predecessors in 1880. Nevertheless, the 1950 census was a more complex task. From 4 settlements concentrated in a small corner of south-eastern South Dakota, they had branched out into 93 colonies. As shown on the map in figure

1, they are dispersed widely in 1950 throughout South Dakota, North Dakota, Montana, Alberta and Manitoba.[4]

Our inquiries began with a brief questionnaire sent to all colonies during the months of December 1949 and January 1950, with a 100% response. This preliminary inquiry, made to plan the field-work,

FIG. 1. ETHNIC HUTTERITE COLONIES IN NORTH AMERICA: 1950.

furnished, among other items, information about the total population, the number of persons over 65 years and under 15 years of age and the sex distribution. During the summers of 1950 and 1951 detailed demographic data were obtained for 71 of the 93 colonies, with about 80% of the population. The methods of inquiry included personal visits by the staff, intensive correspondence and in much of Manitoba, family

[4] By March 1953, five additional colonies had been formed, two of them in the Canadian Province of Saskatchewan.

enumeration by a Hutterite leader.[5] Our data include records of 6,796 individuals, who were living on December 31, 1950. For these persons we have vital statistics broken down by families, colonies, and kinship groups including the following items of information:

a. Birthday or age by last birthday on December 31, 1950.
b. Birth-order within the family for all children ever born to parents living on December 31, 1950, including still-births.
c. Sex.
d. Marital Status.
e. Work or administrative position in the colony.
f. Death and sometimes cause of death of persons who died during the 10 previous years.
g. Residence (if known) of individuals not living in a Hutterite colony at the time of our enumeration.

The information on our sample was checked against many types of records. Some gaps and inconsistencies were found, but most of them could be cleared up through subsequent correspondence with Hutterite leaders. The selection of the 6,796 individuals was not random. It depended largely on the willingness of leaders to cooperate and the geographical ease of access of colonies to our staff. A review of the less detailed demographic data for which there is a 100% response shows the 80% sample for which we have detailed data to be representative of the entire population.

There were 8,542 ethnic Hutterites living on December 31, 1950. While the United States population increased 14.5% between 1940 and 1950, the Hutterites increased 52.1% in the same period, more than three times as rapidly. The Hutterite growth, as we shall demonstrate later, is largely a function of the excess of births over deaths. No other human population for which there are good vital statistics has shown a comparable steady growth over a prolonged period of time, except through migration.

The distribution of the 1950 population by age and sex is shown in table 3. It is more regular than it was in 1880. The three demographic

[5] Rev. Samuel Kleinsasser of the Sturgeon Creek Colony in Manitoba visited many Hutterite settlements in the province to take the family data needed for this study.

features to which we called attention in our discussion of the 1880 findings are also found 70 years later:

TABLE 3

Distribution of the Hutterite Population by Age and Sex on December 31, 1950

AGE	MALE	FEMALE	TOTAL
Under 1	175	179	354
1–4	698	680	1,378
5–9	722	646	1,368
10–14	595	629	1,224
15–19	434	474	908
20–24	330	337	667
25–29	298	304	602
30–34	231	231	462
35–39	189	213	402
40–44	165	120	285
45–49	125	111	236
50–54	91	91	182
55–59	74	69	143
60–64	46	40	86
65–69	39	25	64
70–74	22	29	51
75–79	5	6	11
80–84	5	3	8
85–89	3	1	4
90 and over	0	2	2
Unknown	34	72	106
Total	4,281	4,261	8,542

1. The number of males and females in 1950 was nearly equal (4,281 and 4,261).
2. Slightly over half of the population, 50.6%, was under 15 and 2.3% was over 65.
3. There were more males than females in the age groups over 40.

AGE AND SEX DISTRIBUTION

Age Distribution

In 1880, the population of the United States was predominantly youthful. Not only the Hutterites, but most American groups had a large proportion of infants and young children. This was the result

of a combination of a high birth rate, a relatively low life-expectancy and the preponderance of young people among immigrants. During the following 70 years the age distribution of the American population changed. The proportion of older people increased steadily.

The Hutterites did not follow this trend. In 1950, even more than in 1880, they were a youthful group, as shown in table 4. They may hold a demographic " world record " for a relatively youthful age distribution.

TABLE 4

Age Distribution of Hutterites and Selected Populations (in per cent)[1]

	TOTAL	UNDER 5 YEARS	5 TO 19 YEARS	20 TO 44 YEARS	45 TO 64 YEARS	65 YEARS AND OVER
Hutterites (1950)	100	20	41	29	8	2
United States (1950)	100	11	24	37	20	8
Algeria (Moslems) (1948)	100	15	38	32	12	3
Jamaica (1948)	100	13	33	37	13	4
Israel (1948)	100	13	24	44	15	4

[1] United Nations Demographic Yearbook ('51).

Their age distribution has been quite stable through time. This can be shown through the application of the survivorship method to the 1950 age distribution to obtain the age distributions for the previous decades. The 1880 population was projected forward to 1910. The data are presented in figure 2, showing the population pyramids for decennial periods from 1880 to 1950.

Sex Distribution

There is nothing unusual in the overall Hutterite sex ratio. It has remained quite stable over the entire period. It was 99 in the 1880 census, 101 in the 1950 census and, by projection, 99 in 1940. As is usual in many human populations, there is a slight excess of males in the age group under 15. In the 5-9 year age group, there is an unusually high disproportion of males over females. The same irregularity can be observed in the rural farm population of the United States.[6] In

[6] The male death rate exceeds that of females when it is summed over the entire 0-14 age span (see table 17), but this sex difference is not consistent for the entire span. The female death rate of Hutterites from 1-4 is higher than that of males. The rates are reversed in the age groups of 5-9 and 10-14. These

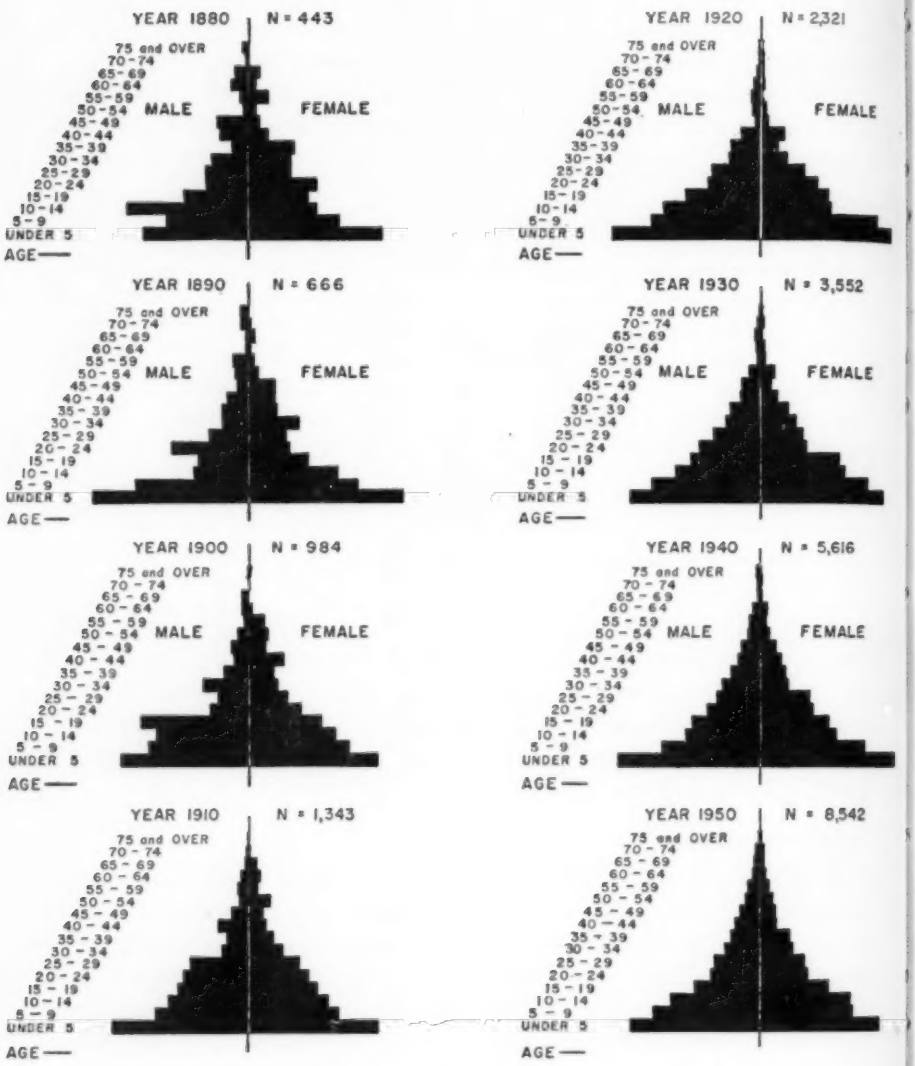

FIG. 2. POPULATION PYRAMIDS, ETHNIC HUTTERITES: 1880 to 1950.

most other populations the reverse conditions pertain. We have no explanation for this strange sex-ratio in the 5-9 year age group. It could be a sampling accident. However, a preliminary inspection of demographic data from other rural areas indicates that this phenomenon occurs elsewhere. Further study seems to be indicated to explore if there are biological or social forces which have gone unnoticed so far, which produce this high sex ratio in the 5-9 year age group of certain populations.

But it is very unusual to find a male predominance among the older age groups, as there is among Hutterites 40 years old and older. Hutterite men who live beyond 40 seem to have a greater life expectancy than women. This fact also makes sense in light of the finding that there were 72 men as against 61 women who had lost their spouse through death, although Hutterite husbands are on the average one and one-half years older than their wives.

There is good reason to assume that Hutterite males have a higher life-expectancy than females at all adult ages, even in the 15-39 and 70-74 age groups, when the number of women enumerated in 1950 was greater than the number of males. It is probable that there was an under-enumeration of males over 15 in some of the colonies, particularly those containing the 20% of the population for which complete family data could not be obtained. Males outnumbered females by a ratio of 13 to 1 among the Hutterites in 1950 who were known to have left their colony. These "deserters" are sometimes forgotten because their names were not always kept in the current records of their colony. Most of them were 15-19 years of age, with progressively declining numbers in the older age groups. Many of the youngsters return to the "fold" during their twenties, after having tried life on their own. The excess of females is greatest in those age groups in which males desert and becomes progressively less in the older age groups.

The finding that Hutterite men tend to outlive women might be a function of the large number of pregnancies experienced by the great majority of Hutterite wives. In the past, nearly all of their confinements were without the supervision of physicians. While Hutterite women

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rates are based on such small numbers of deaths that the variations would not necessarily be significant. However, they do fit with our data on the age distribution of the Hutterite population. The observance of the same irregularity in the American rural farm population indicates that the problem warrants more careful investigation.

do enjoy the help of self-trained midwives, some of whom have remarkable practical know-how, the cumulative effect of these numerous medically unattended pregnancies may be to shorten the length of life of women, who—in general—survive males in reproductively less active populations.

The Hutterites also demonstrate a demographic truism: A rapidly growing population is very youthful. About 51% of the 1950 population was under 15 years of age. Two percent were over 65 years of age. Persons in these age groups cannot be expected to be fully productive economically or active in the management of the group's affairs. If we add to this finding the fact that the majority of female adults were preoccupied with the care of their large families, it becomes very clear that a relatively small number of Hutterite male adults must provide economic support for their rapidly growing group. This might be difficult if it were not for the Hutterite values which emphasize a sharing of all property and the spiritual virtue of living at an austerity standard. In most cultural settings, a rapid population growth like that experienced by the Hutterites would tend to be checked by difficulties of providing the offspring of most families with the essentials of food, clothing, shelter and medical care. The Hutterite economy and value system are uniquely designed to deal with this problem. Even an inefficient or ill father can support a large family, while the more capable members of the group forego the economic benefits which would accrue to them if they were to be paid wages for their labor based on their importance to the group effort. They do this out of religious conviction and ethnic loyalty. It is doubtful that the Hutterite reproductive record could be maintained were competing American materialistic and secular values to bring about any major modification in their communal economic structure.

REPRODUCTION

Human Fecundity and Fertility

Fecundity, the physiological capacity for reproduction, is fairly well known for many animal species. There are no equally reliable data for *Homo sapiens*. Reproduction in human beings is not purely instinctive behavior expressed during a mating season or a period of "heat." It is a socio-biological process. It involves some of the most strongly held cultural values and taboos. No human group which has been available for study to demographers over a long period of time have had sex and

marriage practices which encouraged reproduction at a high enough level to come close to their possible biological maximum. But it would be useful if an estimate of this theoretical maximum could be made.

The concept of *population fecundity*, to be used here, will refer to the number of living offspring produced by a group of women in their total reproductive life time. This definition differs somewhat from the conventional meaning attached to this term by biologists and students of population, but it permits us to answer the really crucial question: How many children can a group of human beings have if they reproduce up to the limit of their biological capacity and live through their entire period of potential fertility? This concept also facilitates the answer of the corollary question: How many children are *not* produced by a group of human beings because some of their cultural values, customs or habits interfere with biologically possible reproduction?

The vital statistics of the Hutterites can serve as a basis for making such estimates. Fertility will be analyzed through a number of measures in common use by demographers to permit a cross-cultural comparison of relevant populations, including the following:

1. The crude Birth Rate
2. The Fertility Ratio
3. Age Specific Birth Rates
4. Completed Family Size
5. Nuptial Age Specific Birth Rates

The Crude Birth Rate

The crude birth rate of the sect, the number of births per 1,000 population was 45.9 during the 5 year period of 1946 through 1950. This rate is based on complete fertility data for the 80% sample.

This crude birth rate of nearly 46 per 1,000 is high (see table 5) but not the highest in the world. However, it is well known that crude birth rates are not an accurate measure of fertility since they are not corrected for the great variations in the age and sex distribution of the different populations. They are, as their name indicates, only a *crude* measure of fertility.

The Fertility Ratio

The fertility ratio, the number of children under 5 years of age per 100 women of age 15 to 49, is a somewhat more accurate measure of fertility than the crude birth rate. But it has somewhat less comparability. It cannot be obtained for some populations because its calculation requires data on the detailed age and sex distribution of the population.

Among the Hutterites, the 1950 fertility ratio was 96.3 per hundred women. It is greater than that of any other human population. It is more than twice the total United States fertility ratio in 1950 and 53% higher than that of Algerian Moslems in 1948, the highest fertility ratio reported in the 1950 United Nations Demographic Yearbook. The cross-cultural comparisons are given in table 6.

TABLE 5

Crude Birth Rates of the Hutterites and Selected Populations[1]

POPULATION	CRUDE BIRTH RATE
Hutterites (1948)	45.9
Algeria (Moslems) (1949)	34.1
Jamaica (1948)	30.9
Israel (1948)	26.8
United States (1948)	24.2

[1] United Nations Demographic Yearbook ('51).

TABLE 6

Fertility Ratios of the Hutterites and Selected Populations[1]

POPULATION	CHILDREN UNDER 5 YEARS OF AGE, PER 100 FEMALES 15 TO 49
Hutterites (1948)	96.3
Algeria (Moslems) (1948)	63.1
Jamaica (1949)	49.5
Israel (1948)	45.8
United States (1950)	42.3

[1] United Nations Demographic Yearbook ('51).

The fertility ratio is an improvement over crude birth rates, but it also has some shortcomings as a measure of fertility. It makes only a rough correction for variations in the age distribution of different populations. It also takes no account of marital status. It does reflect mortality, however.

Age Specific Birth Rates

Age specific birth rates are more accurate measures of fertility

because they take more complete account of the variations in the age distribution of a population. We will employ two measures here:

1. The age specific fertility rate. It is the number of births per year to 1,000 women in a specific age group including both *married* and *unmarried* women.
2. The age specific nuptial fertility rate. It is the number of births per year to 1,000 *married* women in a specific age group.

In table 7 the age specific fertility rates of the Hutterite population are given, together with the highest observed rates reported in the 1950 United Nations Demographic Yearbook. This cross-cultural comparison shows Hutterite females to have a record fertility in all but the 15-19 year old age groups.

TABLE 7

Age Specific Fertility Rates of the Ethnic Hutterite Population 1946–1950 and of Selected Countries

AGE GROUP [1]	TOTAL HUTTERITE WOMEN	NUMBER HUTTERITE WOMEN MARRIED	NUMBER OF BIRTHS 1946-1950	ANNUAL AGE SPECIFIC NUPTIAL FERTILITY RATE	ANNUAL AGE SPECIFIC FERTILITY RATE	HIGHEST OBSERVED AGE SPECIFIC FERTILITY RATE CIRCA 1948 [2]
15–19	301	39	18	92.31	11.96	103.1 (Jamaica)
20–24	252	173	291	336.42	230.95	227.3 (Jamaica)
25–29	220	169	421	498.22	382.73	268.4 (Japan)
30–34	180	159	352	442.76	391.11	233.3 (Japan)
35–39	130	121	224	370.24	344.61	156.4 (Japan)
40–44	96	93	100	215.06	208.34	59.4 (Netherlands)
45–49	76	74	16	43.24	42.11	6.8 (Jamaica)
Total	1,255	828	1,422			

[1] The ages of Hutterite women are listed as of *June 30, 1948*, the center point of five year period 1946-1950. The data are from our 80% sample for which complete fertility records were obtained.

[2] United Nations Demographic Yearbook ('49-'50).

The relatively low fertility of young Hutterite girls reflects their custom of marrying only after adult baptism has taken place. The median age of marriage in 1950 for Hutterite women was 22.0. For men the corresponding median was 23.5. Among the 301 girls who were between the age 15-19, only 20, or about 7% were married before they were 19.

None were married before they reached their sixteenth birthday. The age specific fertility rate of 12.0 per 1,000 for this age group is quite low, much lower than the 79.8 per 1,000 of the U. S. population. This clearly indicates the importance of Hutterite social taboos in inhibiting reproduction during the late adolescent years.

TABLE 8

Number and Percentage of Persons over 30 Never Married In 70 Hutterite Colonies in 1950 [1]

MALE

AGE GROUP	TOTAL POPULATION	TOTAL UNMARRIED	PER CENT UNMARRIED IN AGE GROUP	SEX RATIO
30–34	181	7	3.9	1.00
35–39	148	4	2.7	.89
40–44	131	1	0.8	1.38
45 & over	323	3	0.6	1.09
Total	783	15	1.9	1.05

FEMALE

AGE GROUP	TOTAL POPULATION	TOTAL UNMARRIED	PER CENT UNMARRIED IN AGE GROUP	SEX RATIO
30–34	184	27	14.1	1.00
35–39	166	17	3.6	.89
40–44	94	4	4.3	1.38
45 & over	299	4	1.3	1.09
Total	743	52	5.4	1.05

[1] Non ethnic Hutterites who became converted and their children are excluded from this tabulation, which is based on 78.9% of the total ethnic Hutterite population. Excluded also are 9 persons age unknown, and 106 male and 8 female Hutterites known to have left Hutterite colonies before December 31, 1950, who may have been alive at that time.

The peak of nuptial fertility is in the 25-29 year old group. The rate during this period is 498 per 1,000. In other words, women in this age group average one birth every two years. The high fertility rates of the Hutterites after the age of 20 is a reflection of their cultural encouragement of reproduction. Few adults are single by the time they reach their thirtieth birthday. As table 8 shows, less than 2% of the

males 30 years old and older were unmarried. Among women failure to marry was more common. Slightly over 5% of these over 30 were spinsters. In a population which is rapidly increasing there tends to be a surplus of women if men marry girls younger than themselves. Yet it is doubtful that many Hutterite spinsters are condemned to their state of single blessedness simply by an inability to find a marriage partner. There are too many volunteer match-makers among friends and relatives to permit that. Health reasons, a desire to remain at home with parents, and personality factors were found to be involved in the few instances when girls chose to remain single. The surplus of females among Hutterites is gradually absorbed, partly because men tend to remarry, while women rarely do. Fifty-five percent of the 72 widowers remarried, as against 5% of the 61 widows. By the time Hutterites reach their forty-fifth birthday, only about one percent of either sex have never been married. The high marriage rate of Hutterites is mirrored in the tendency for age specific and nuptial fertility rates to converge as the age of women increases. In the 40-44 and 45-49 year age groups, when all but 4.3 and 1.3% respectively of the women are married, the two age specific rates are fairly close to each other.

Hutterite couples are rarely separated after marriage. In the history of the group since 1875 there has been only one divorce and only 4 desertions. We know of one other case where husband and wife separated temporarily to live in different colonies. There may have been a few other such cases, although if the separation had extended over a span of several years the cases could hardly have escaped the attention of our field staff. Family break-up through death has been much more common. There were 133 persons in the 80% sample who had lost their consorts through death, about 6% of all married males and females.

Regularity in exposure to pregnancy appears to be accepted as normal in marriage, but sex relations are severely frowned upon during the pre-marital period.[7] There are, no doubt, considerable variations in sexual activity among families within the culture but our study did not attempt to investigate this topic. There are no general customs which inhibit sex relations of married persons, except for a few weeks before parturition and for about 6 weeks afterwards. In general, our interview

[7] Illegitimate births are very rare. We have some evidence that 10 babies may have been born outside of wedlock since 1875. While it is not possible for us to give a precise rate for this phenomenon, we estimate that illegitimate births account for less than two tenths of one percent of all births since 1875.

data suggest that after the marriage vows are taken, women are regularly exposed to the chance of fertilization.

The magnitude of the age specific fertility rates of the sect can be summarized by the comparisons made in table 9. They show:

TABLE 9

Actual and Expected Number of Births of the Ethnic Hutterite Population Calculated by U. S. and Highest Recorded Age Specific Birth Rates in 1950[1]

AGE GROUP	NUMBER OF HUTTERITE WOMEN	UNITED STATES RATE	HIGHEST RECORDED AGE SPECIFIC	EXPECTED NUMBER OF BIRTHS BY U. S. RATES	EXPECTED NUMBER OF BIRTHS BY RATE OF HIGHEST COUNTRY	ACTUAL NUMBER OF BIRTHS
15–19	301	79.8	103.1 (Jamaica)	12	103	18
20–24	252	193.2	227.3 (Jamaica)	243	286	291
25–29	220	160.6	268.4 (Japan)	177	295	421
30–34	180	100.5	233.3 (Japan)	90	210	352
35–39	130	53.2	156.4 (Japan)	35	102	224
40–44	96	15.2	59.4 (Netherlands)	7	29	100
45–49	76	1.2	6.8 (Jamaica)	1	3	16
Total	1,255			565	1,028	1,422

[1] United Nations Demographic Yearbook ('51).

1. Only 39% as many Hutterite babies would have been born if the Hutterites in 1950 had had age specific birth rates similar to those of the United States in general.
2. Only 62% of the Hutterite babies would have been born if the Hutterites in 1950 had had age specific birth rates similar to those of the country listed in the 1950 United Nations Demographic Yearbook as having the highest recorded birth rate in each 5-year group.

Variations of Birth Rates

The remarkable fertility of the sect now may be regarded as established. One further question remains before making an estimate of fecundity. A considerable portion of population theory has been concerned with the question whether reproductive capacity changes, presumably lessens, as a population matures. Are the Hutterites following other groups in showing a decrease in birth as they accept modern

technological changes and come into more contact with the larger American Society?

Completed Family Size

Completed family size, the number of children ever born to a woman before reaching the age of 45,[8] can be used as a measure of fertility trends. There seems to have been a slight increase in family size since 1880 (table 10). The 166 younger women who were between 45 and 54 in 1950 had an average number of 10.6 live births. The 162 who were between 55 and 74 years of age had an average of 9.9 children.[9] It is

TABLE 10

Number of Children Ever Born to Married Ethnic Hutterite Women 45 Years of Age and Over, 1950

Age Group	NUMBER OF CHILDREN																		Median
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total	
45-49	2	0	3	2	2	2	7	10	4	11	10	9	13	6	7	6	0	94	10.9
50-54	1	1	1	2	2	5	3	8	9	5	4	11	9	3	2	3	3	72	10.3
55-59	4	1	2	2	3	4	6	3	4	9	6	12	4	1	3	0	1	65	9.9
60-64	2	0	1	0	1	2	1	1	6	6	8	3	1	2	2	2	0	38	10.3
65-69	0	0	1	3	0	0	1	0	7	7	2	2	1	2	1	3	0	30	9.9
70-74	1	2	1	0	1	0	1	1	1	3	9	4	1	2	1	1	0	29	9.2
75-79	0	0	0	0	1	1	0	3	0	0	1	0	0	0	1	0	0	7	....
80-85	0	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	0	5	....
Total	10	4	9	10	10	14	20	25	31	42	40	42	29	16	18	15	4	340	10.4

possible that the greater completed family size of younger women is due to the improvement of medical care in recent decades, reducing the number of still-born and strengthening the general health of mothers. The inverse relationship of women in 1950 and completed family size is a further clue to the validity of the assumption that a large number of pregnancies has an adverse effect on longevity. For example, the fact that the 12 women who were 75 years old and older and alive in 1950 had only an average of 7.5 children (a suspiciously low number for

[8] It is conventional to calculate completed family size on the basis of the number of children born to women between the age of 15 and 45. Actually, this convention neglects the fact that some births take place after 45 years of age.

[9] The completed family size of the Hutterites is similar to that recently reported by Keyfitz ('53) for rural French Canadians.

Hutterites!) might be due to the failure of women with very large families to survive to be counted in our 1950 census. Finally, the possibility cannot be ruled out that older women failed to record some of their children who died young or left the colony a long time ago. However, the internal consistency of our data makes it appear doubtful that such forgetfulness was widespread.

No significant differences in completed family size were found to be associated with kinship group membership or social position. The median family size of 118 wives of preachers, business managers and other community leaders 45 years old or older, was 10.2 children. For wives of regular members, without any position of formal leadership in 1950, the median family size was 10.4 children. In both groups, about 5% of the babies were reported to have died before reaching their first birthday. While most populations vary greatly in socio-cultural factors associated with fertility, such as education, occupation, income and status, Hutterites do not. They are not made out of one mold, but their culture is characterized by a high degree of homogeneity. There are virtually no class distinctions. All people in a colony have the same level of living. There are variations in social prestige, which are largely a function of sex, age, intelligence and religious grace. But these variations do not seem to affect fertility.

Nuptial Age Specific Birth Rates

A comparison of the annual nuptial age specific birth rates for the periods 1926-1930, 1936-1940 and 1946-1950 is shown in table 11. Many of the variations in the rates of 5 year age groups throughout this period are not significant. They are based on small numbers. The following trends may be observed:

1. Hutterite fertility has been generally high throughout the 30 year period.

2. Nuptial fertility rates have decreased progressively for the 15-19 and 20-24 year groups. The trend is particularly marked for the 15-19 year age group. Their nuptial rates have grown considerably smaller. World War II contributed greatly to pushing the rate for 1946-1950 down below the level it might otherwise have maintained. The differences in nuptial rates of 20-24 year olds between 1936-1940 and 1946-1950 disappear when corrected for the number of years women were actually married during these 5 year periods. Many young Hutterite males were

TABLE 11

Age Specific Fertility Rates for the Ethnic Hutterites 1926–1930, 1936–1940, 1946–1950

AGE GROUP	TOTAL HUTTERITE WOMEN	MARRIED HUTTERITE WOMEN	PERCENT MARRIED	NUMBER OF BIRTHS	ANNUAL AGE SPECIFIC BIRTH RATE	ANNUAL AGE SPECIFIC NUPTIAL BIRTH RATE
1926–1930						
15–19	130	6	4.6	11	16.9	366.7
20–24	103	68	66.0	138	268.0	405.9
25–29	92	85	92.4	192	417.4	451.8
30–34	69	66	95.7	137	397.1	415.2
35–39	40	40	100.0	71	355.0	355.0
40–44	36	36	100.0	43	238.9	238.9
45–49	34	34	100.0	4	23.5	23.5
Total	504	335	66.5	596	236.5	355.8
1936–1940 [1]						
15–19	198	11	5.6	13	13.1	236.4
20–24	176	117	66.5	228	259.1	389.7
25–29	129	120	93.0	300	465.6	500.8
30–34	98	97	99.0	224	461.9	466.7
35–39	85	84	98.8	183	430.6	435.7
40–44	68	65	95.6	69	202.9	212.3
45–49	42	42	100.0	10	47.6	47.6
Total	796	536	67.3	1,027	258.0	383.2
1946–1950						
15–19	301	39	13.0	18	12.0	92.3
20–24	252	173	68.7	291	231.0	336.4
25–29	220	169	76.8	421	382.7	498.2
30–34	180	159	88.3	352	391.1	442.8
35–39	130	121	93.1	224	344.6	370.2
40–44	96	93	96.9	100	208.3	215.1
45–49	76	74	97.4	16	42.1	43.2
Total	1,255	828	66.0	1,422	226.6	343.5

[1] Thirteen births, age of mother unknown have been allocated.

absent from their home during several years in which they served either in a camp for Conscientious Objectors or in the Armed Forces. This delayed many marriages. When corrected for this there was a little change in fertility as is shown in table 12.

TABLE 12

Number of Children per Year of Marriage Born to Women Age 20–24 in 1940 and 1950

	1940				1950			
AGE	NUMBER OF WOMEN	TOTAL YEARS OF MARRIAGE	NUMBER OF CHILDREN	RATIO	NUMBER OF WOMEN	TOTAL YEARS OF MARRIAGE	NUMBER OF CHILDREN	RATIO
20	5	2.5	2	.80	7	7.5	3	.40
21	17	17.0	9	.53	19	20.5	13	.63
22	17	30.5	24	.79	24	38.5	20	.52
23	23	52.0	32	.62	35	74.5	54	.72
24	26	68.5	45	.66	41	79.0	65	.82
Total 20–24	88	170.5	112	.66	126	220.0	155	.70

3. The peak of nuptial fertility in every decade is in the 25-29 age group. Married women have about one child every two years during that time.

4. Nuptial fertility for women in the 35-39 year age group was highest in 1936-1940 and dropped off markedly in 1946-1950. This finding suggests that birth control practices might be beginning to make inroads, although it might merely be a temporary fluctuation.

5. The Hutterite nuptial fertility of 1936-1940 did not parallel the trends of the American population in general. Birth control practices, the economic after-effects of the depression and a related negative evaluation of child-bearing, important factors in lowering American rates during that period, did not seem to affect the Hutterites.

Hutterite Fecundity

We are now ready to make an estimate of the fecundity of the Hutterite population from its fertility data. It is assumed that Hutterite fertility approximates fecundity except in the early years of the reproductive period.

The estimates are based on the concept of probability of conception

of a live child [10] by a married woman living with her spouse, at a given age, in a given year. Each such Hutterite woman (living or dead) was carried through her fertility period beginning with the year of her marriage and ending with her fifty-first year. If she was less than 51 years old in 1950, her fertility experience to that date was tabulated. For every year of exposure to pregnancy a tabulation was made as to whether or not a conception which resulted in a live birth took place. The results are shown in table 13. The probability of having a live birth during the middle year of each 5 year age group is indicated in figure 3. Over the entire reproductive span, the summation probabilities yields a figure of nearly 12 live births per woman, married at the age of 18, and living with her husband through her fifty-first year of life.

We have no estimates of fertility for the ages under 18, when few Hutterites get married. The peak seems to be in the twentieth year of life, when 61.1% of the married women had a live birth. In the years following this peak, fertility declines progressively, but slowly. Not until about the fortieth year of age does the rate of decline become pronounced. Fertility approaches zero at the age of 49. The decline reflects a decrease in fecundity. The extent to which this is the case is not certain because the frequency of sexual relations in marriage also tends to decline with age. (Kinsey, et al., '48: 252 and '53: 348-354.) It appears that the fecundity of human beings is far more stable than has been generally assumed. Its decline with age is probably even more gradual than is suggested in figure 3.

On the surface, the finding that the peak of population fecundity is in the twentieth year of life contradicts our prior observation that nuptial fertility rates were highest for women in the 25-29 year age groups. This artifact is the result of the process of combining the data in 5-year age groups. Women in the 20-24 year age group were actually exposed to motherhood for only about $1\frac{3}{4}$ out of the 5 years; those in the 25-29 year period were exposed for about 4 years. Hutterite women are more fertile in their early twenties, but not enough of them are married to yield 5-year grouped nuptial fertility rates to indicate this fact. This finding is a good illustration of the limitation of grouped nuptial fertility rates as measures of population fertility.

[10] Still births are excluded. The elimination of abortions, miscarriages and still births, and consequently the viewing of fecundity in terms of live births only, sharpens and clarifies the concept although this operational definition of fecundity is not in accord with the usual meaning of the term.

TABLE 13

Probability of Having a Live Birth at a Given Age, by Decade of First Marriage, Ethnic Hutterite Women

Age	Before 1921				1921-1930				1931-1940				1941-1950				Total			
	Total	Births	No Births	Probability	Total	Births	No Births	Probability	Total	Births	No Births	Probability	Total	Births	No Births	Probability	Total	Births	No Births	Probability
15	...	...	...	....	...	...	...	....	...	...	...	....	...	...	...	....	...	...	...	....
16	...	...	...	....	...	...	...	....	1	1	...	....	...	...	...	....	1	1	...	....
17	...	...	...	....	2	...	2	....	1	...	1	....	3	1	2	....	6	1	5	....
18	15	7	8	.467	10	4	6	.400	6	5	1	.833	8	5	3	....	39	21	18	.538
19	64	34	30	.531	41	29	12	.707	21	11	10	.524	30	19	11	.633	156	93	63	.596
20	116	64	52	.552	82	47	35	.573	88	67	21	.761	82	47	35	.573	368	225	143	.611
21	138	64	74	.464	119	74	45	.622	142	85	57	.599	132	92	40	.697	531	315	216	.593
22	161	73	88	.453	133	72	61	.541	183	107	76	.585	174	121	53	.695	651	373	278	.573
23	171	82	89	.479	151	76	75	.503	203	103	100	.507	184	106	78	.576	709	367	342	.518
24	172	77	95	.448	152	81	71	.533	271	132	139	.487	165	104	61	.630	760	394	366	.518
25	174	86	88	.494	156	77	79	.494	233	125	108	.536	152	96	56	.632	715	384	331	.537
26	174	81	93	.466	165	89	76	.539	232	117	115	.504	139	81	58	.583	710	368	342	.518
27	176	77	99	.438	164	83	81	.506	238	133	105	.559	108	69	39	.639	686	362	324	.528
28	175	69	106	.394	160	82	78	.513	235	106	129	.451	80	35	45	.438	650	292	358	.449
29	176	82	94	.466	162	74	88	.457	231	130	101	.563	60	38	22	.633	629	324	305	.515
30	171	64	107	.374	165	73	92	.442	233	108	125	.464	38	16	22	.421	607	261	346	.430
31	169	82	87	.485	163	75	88	.460	220	117	103	.532	26	15	11	.577	578	289	289	.500
32	169	68	101	.402	165	68	97	.412	199	96	103	.482	17	11	6	.647	550	243	307	.442
33	176	75	101	.426	168	82	86	.488	179	73	106	.408	10	3	7	.300	533	233	300	.437
34	164	72	92	.439	163	70	93	.429	155	67	88	.432	6	4	2	.667	488	213	275	.437
35	169	65	104	.385	163	86	77	.528	136	60	76	.441	7	4	3	....	475	215	260	.453
36	168	65	103	.387	162	56	106	.346	98	43	55	.439	6	3	3	....	434	167	267	.385
37	164	63	101	.384	162	65	97	.401	75	29	46	.387	6	3	3	....	407	160	247	.393
38	167	60	107	.359	159	71	88	.447	55	20	35	.364	6	3	3	....	387	154	233	.398
39	159	56	103	.352	147	44	103	.299	41	18	23	.439	5	1	4	....	352	119	233	.338
40	159	47	112	.296	138	52	86	.377	28	4	24	.143	3	1	2	....	328	104	224	.317
41	155	45	110	.290	123	28	95	.228	22	10	12	.454	2	0	2	....	302	83	219	.275
42	149	27	122	.181	118	29	89	.246	18	4	14	.222	2	1	1	....	287	61	226	.213
43	147	25	122	.170	96	15	81	.156	12	1	11	.083	...	...	...	....	255	41	214	.161
44	146	11	135	.075	88	9	79	.102	12	1	11	.083	...	...	...	....	246	21	225	.085
45	143	16	127	.112	73	7	66	.096	12	1	11	....	...	...	...	....	228	24	204	.105
46	141	3	138	.021	56	1	55	....	8	0	8	....	...	...	...	....	205	4	201	.020
47	141	1	140	....	47	2	45	....	9	1	8	....	...	...	...	....	197	4	193	.020
48	139	0	139	.000	36	4	32	.111	6	0	6	....	...	...	...	....	181	4	177	.020
49	136	0	136	.000	25	1	24	....	6	0	6	....	...	...	...	....	167	1	166	.006
50	129	0	129	.000	18	1	17	.056	4	0	4	.000	...	...	...	....	151	1	150	.007
51	125	2	123	.016	16	0	16	.000	4	0	4	.000	...	...	...	....	145	2	143	.013

PROBABILITY

.0 .1 .2 .3 .4 .5 .6

Fertility has not remained stable over the period under review. As shown in table 13 it has increased with great consistency in each age group with each succeeding 10 year period. There has been a rise in the number of live births to women during the entire reproductive span.

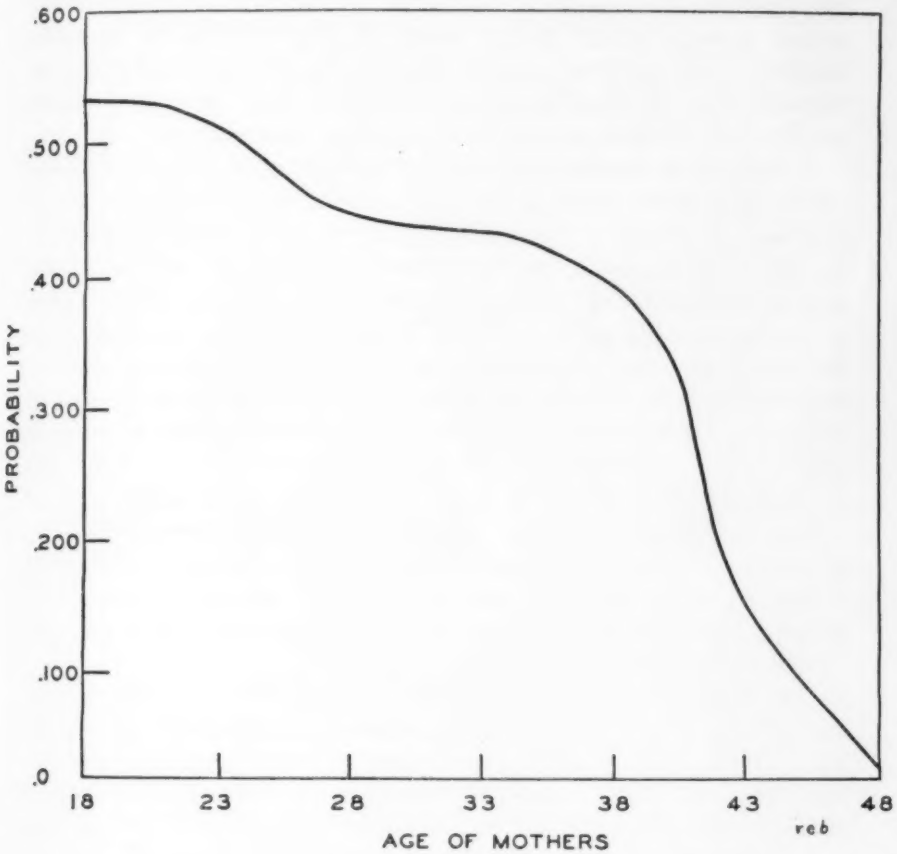

FIG. 3. PROBABILITY OF HAVING A LIVE BIRTH AT A GIVEN AGE, ETHNIC HUTTERITE WOMEN.

Women married at 18 before 1921 who remained married through their fifty-first year of life, had 10.8 live children. The number increased to 12.0 for women married between 1921 and 1930, and 12.3 for women married between 1931 and 1940. The same steady increase can be

observed if we sum only the number of live children through the thirty-fifth year of life. These data are more reliable because they are based on larger numbers in each age group. For women married before 1921 the number of live children was 7.8 for married women 18-34 years of age. The equivalent numbers were 8.6 for women married in the decade 1921-1930, 9.2 for women married in the decade 1931-1940 and 9.3 for women married in the decade 1941-1950. Split halves of the data matched almost perfectly so as to give considerably more confidence in the reliability. It should be noted further that this same general trend was found in the data on completed family size (see table 10).

A number of factors could account for this trend. One is that the longer ago a birth occurred, the greater tendency for women to forget to report it. However, it seems unlikely that this could account for the extremely consistent rise in fecundity, particularly in view of the Hutterite emphasis on keeping family records. A more likely factor is the increasingly good health of Hutterite women, resulting in a decrease in abortions, miscarriages, and stillbirths with a reciprocal rise in successful deliveries. It may also reflect an increase in the number of conceptions. The previously reported drop in the 1946-1950 age specific birth rates of women 35-39 is not apparent in the fecundity data. The two measures were calculated on the basis of the birth performance of different groupings of women. A short-term trend in age-specific birth rates of a single age group could be masked by the methods of classifying women by their decade of marriage used in fecundity calculations. However, if this trend continues, it will probably show up in the next decade as a decrease in fecundity.

The maximum population fecundity of the Hutterites can be estimated by making allowance for the number of children who might be born, if Hutterite customs encouraged women to marry younger. Fecundity at these early ages (13-17) cannot be estimated easily because of the phenomenon of adolescent sterility. On the basis of information from primitive cultures, some anthropologists believe that girls are not very fertile during their first few post-pubertal years. Relatively few girls are capable of reproduction before 15 years of age and even then their reproductive capacity is not as great as it will be later (Ford and Beach, '51). Accepting this theory, at least for the purpose of making an estimate of maximum fecundity, one to two and a half children might be added to the totals. The maximum fecundity of the Hutterite population would then range somewhere between 12 and 14 live births,

for women reproducing at rates of the 1931-1940 decade. The actual completed family size of Hutterite women is about one to three children less than this maximum theoretical number of births because most Hutterite women marry after reaching the age of 20 and some lose husbands before they reach the end of their reproductive cycle.

Number of Children Still Possible After Any Given Age

Unless the Hutterites are genetically unusual, their population fecundity can be used to estimate the number of live children women can conceive after any given age. It should be noted that numbers cannot be applied to an individual case. The data are shown in table 14.

TABLE 14

Number of Children Still Possible per Woman After Any Given Age by Five Year Age Groups, for the Ethnic Hutterite Women Living on December 31, 1950

AGE	NUMBER OF LIVE BIRTHS STILL POSSIBLE
50 and over	.02
45	.19
40	1.24
35	3.21
30	5.46
25	8.00
20	10.82
15	11.95–13.85 [1]

[1] No data were available for the 15th, 16th and 17th years. Our estimates have to be given as a range because we do not know the fecundity during these years. The minimum estimate assumes complete adolescent sterility below the 18th year, and the maximum estimate is based on a probability of having a child during the 15th through the 17th years as great as during the 18th and 19th years. The most likely estimate lies somewhere between these extremes, about 13 children.

These numbers underestimate the chances of giving birth of women who have recently begun their reproductive cycle. As we have mentioned previously, and have shown in table 13, the fertility of women married during the decade of 1941-1950 is considerably above that of the average of all Hutterite women living in 1950, whose pregnancy experience was used to make these expectancy estimates, probably because they get better food and medical care. If the trend toward higher fecundity

continues, the probable number of live births to the recently married women who enjoy the most up to date sanitary, nutrition and health standards, will be even higher.

Is Hutterite Fecundity Unusually High?

The question whether Hutterites are more fecund than the general American population cannot be answered conclusively. In lower organisms, as Pearl ('25; '39) shows, great hereditary differences in reproductive capacity are found. In most human groups, such biological questions cannot be readily investigated. The Hutterites may be an exception to this rule. With their cooperation it would be possible to go beyond our present data to investigate familial (genetic), constitutional, psychological, social and cultural variables which affect their high birth rate. Such a study is being planned for the near future. In the meanwhile, some of the relevant facts related to Hutterite fecundity should be noted.

1. *Moderate Total Family Size*

There are no Hutterite females with more than 16 live births. Some might have had more, had they married earlier. But none come close to matching some of the unusually high reproductive histories reported by Pearl ('25; '39) and others, as for example the wife of a poor Viennese linen-weaver, who had 32 children, all but 4 of whom were born alive.

2. *Normal Rate of Twinning*

Hutterites have only the usual proportion of multiple births. There were 15 twin births out of a total of 1,422 births recorded during 1946-1950. This ratio of 1 per 95 is within the range of the frequency of multiple births in the United States, which is 1 per 86 (Strandskov '45).

3. *Reproductive Efficiency*

The human ova and spermatozoa have a brief life-span. The period within a woman's monthly cycle during which conception can take place has been estimated to be "a matter of hours, certainly no longer than a day." (Greenhill, '49). Raymond Pearl ('39) reported an average of 244 potentially effective copulations per live birth in women of age 20-29, the age span when fertility is relatively high. Pearl's findings were based on a sample of 184 white married women in Baltimore in whose marital experience no contraceptive effort whatever had been made.

Married Hutterites appear to have a much greater reproductive

efficiency than these Baltimore women. They had an overall average of not quite twice as many children during the 10 year period, 5.36 as against 2.8. They had only slightly more than 13 ovulation cycles, with a maximum of 306 days,[11] in which to conceive each *live* birth. It must be emphasized that these are maximum estimates. They make no allowance for miscarriages, illness and normal separation of husband and wife because of travel. The actual number of ovulation cycles and days during which Hutterite women could have been exposed to reproductively effective copulation is much smaller.

The average of 244 copulations estimated by Pearl to have been necessary to produce each live child in his sample of couples appears to be excessively high. Our study made no attempt to obtain information on the sexual life of the Hutterites, but Kinsey, Pomeroy and Martin found that the frequency of marital relations was "consistently effected by the degree of church affiliation. In practically every instance the religiously active groups engage in marital intercourse less frequently than religiously inactive groups." (Kinsey, Pomeroy and Martin, '48: 482.) Hutterites in general are more religious than most of the persons interviewed by Kinsey and his team and classified by them as "actively religious." If we estimate Hutterite sex relations in the 20-29 year age group to average 2½ times per week, the approximate mean frequency reported in the Kinsey report for actively religious protestants, Hutterite women could have experienced only 108 copulations for each live birth. If an allowance is made for a reduction of this number because of illness or separation because of travel of one or both of the spouses, the Hutterites would appear to be more than twice as efficient reproductively as the couples studied by Raymond Pearl. The latter probably were relatively infertile. Considering their claim that no contraceptive effort whatever was made in their entire marital experience it seems strange that they had only 2.8 live births during the age period of 20-29 and 4.9 children over their entire reproductive span. If one were to assume that the fecundity of the Hutterite population does not differ significantly from that of other human groups who live under civilized standards of nutrition and health care, and with not too much psychological

[11] This estimate is obtained by subtracting from the 3,650 days of the 10 years, 266 days for the gestation period and 42 days for the post-confinement sterility period for each of the 5.36 live children born to the average Hutterite woman who has married between the age of 20-29. In addition, 5 days were subtracted for each of her 71.4 ovulation cycles, estimated to average 28 days.

stress, it appears plausible to assume that Pearl's findings exaggerate the difficulties of unplanned conception.

Low Prevalence Rate of Sterility

There were only 10 childless Hutterite couples among the 340 who had completed their reproductive cycle by 1950. It is most unlikely that any of these 10 families practiced birth control. It can be assumed that in nearly all cases either the husband, the wife, or both, were sterile. This frequency of childless and possible sterile marriages, of 3.4%, is very low. About 10% of the 1977 couples reported in the Indianapolis study were unable to have a child (Whelpton and Kiser, '50: 339). There also are few small Hutterite families. Only 33 women, or about 10% of the women with completed families, had three children or less.

The Social-Psychology of Fertility

The Hutterite population between 1880 and 1950 has clearly violated what sometimes is assumed to be a "law" of population. Their fertility has steadily increased, while at the same time they have become more and more integrated in America's technological culture. This finding, together with the facts that conception is relatively efficient and childlessness is relatively infrequent in this group, could be interpreted to support a social-psychological theory of fertility. Other theories, such as the presence of a genetically transmitted tendency for high fecundity, cannot be ruled out. However, researchers in the field of psychosomatic medicine have long suspected that social-psychological factors play an important role in determining fertility. The positive cultural emphasis on childbearing, which is accepted by most Hutterites, might be the crucial factor in their high fertility. It is well known that emotional states can support or disturb the glandular balance of the human body. Psychic stress could lead to sterility in some persons. Such stresses are found in Hutterites, but they rarely involve problems of parenthood (Eaton and Weil, '54).

MORTALITY

Crude Death Rate

Death is the counter-balance of birth in population growth. In most primitive cultures there is a high birth rate, but also a high death rate. "Natural" checks, as Malthus called social calamities like famine, war and poverty which kill human beings, have stunted the growth of all these primitive populations. The Hutterities differ from other high

fertility groups in that they are not affected by these "natural" checks. Their death rates are low.

There is little doubt about the validity of this finding, although Hutterite vital statistics on deaths are not as good as those on births. There are not enough deaths in the group in any one year, or even over a period of 10 years, to permit the calculation of a life table. It is doubtful that more than 1,000 deaths have occurred in the sect since their migration to the United States.

The crude death rate, the number of deaths per 1,000 population, is 4.4 per year.[12] This rate is very low, if compared with others like that of Algerian Moslems (14.8) a group also having a high proportion of young people. The cross-cultural comparison is shown in more detail in table 15.

TABLE 15

Crude Death Rates of the Ethnic Hutterites and Selected Populations

POPULATIONS [1]	CRUDE DEATH RATES
Hutterites (1941–1950)	4.4
Algeria (Moslems) (1949)	14.8
Jamaica (1948)	13.2
United States (1948)	9.9
Israel (1948)	6.6

[1] United Nations Demographic Yearbook ('51).

Age Specific Mortality Rates

The Hutterite crude death rate does not provide a good picture of their health. The expectancy of death in the group is more similar to that of the general American population than is apparent from the examination of crude rates, for the latter take no account of the unusual

[12] In our 1950 census inquiry Hutterites were asked to list every death occurring in their group between 1941 and 1950. Seventy-one colonies furnished fairly complete replies. A total of 245 persons were reported to have died. Inflating this number to the entire population of the sect, 309 deaths are estimated to have occurred in the last decade. In 1950 there were 8,542 ethnic Hutterites. In 1940, their number is estimated to have been about 5,616. At the midpoint of the period, on December 31, 1945, it is estimated to have been 6,969. The annual crude death rate is therefore:

$$\frac{309 \times 1000}{6969 \times 10} = 4.43.$$

age and sex distribution. Age specific rates provide a more valid method of making a cross-cultural comparison of mortality. They can be used to show how many Hutterites would be expected to die within a given

TABLE 16

Actual Hutterite Deaths, 1941–1950 and the Number Expected on the Basis of 1940 United States Death Rates and 1947 South Dakota Death Rates

AGE	UNITED STATES DEATH RATES [1]	NUMBER OF HUTTERITE DEATHS EXPECTED BY U. S. RATES	SOUTH DAKOTA DEATH RATES 1947 [2]	NUMBER OF HUTTERITE DEATHS EXPECTED BY S. D. RATES	NUMBER OF ACTUAL HUTTERITE DEATHS 1941-1950
Under 1	41.4	125	30.90	93	119
1–4	2.0	24	1.58	19	45
5–14	.9	20	.61	13	30
15–24	2.0	26	1.57	20	14
25–34	2.7	24	2.03	18	16
35–44	4.6	25	2.80	15	23
45–54	9.7	33	6.18	21	16
55–64	20.3	32	14.90	24	15
65–74	44.6	33			20
75–84	99.5	18	80.17	76	10
85 & over	222.5	1			1
Total		361		299	309

[1] The U. S. Life Table of 1939-1941 (White population) is used. The Hutterite rates are calculated from the 245 persons who were reported to have died during the decade of 1941-1950 in our 80% sample. When this frequency is adjusted for the total population, we have only 31 deaths per year, including infant deaths. To achieve at least a minimum degree of stability we are calculating mortality rates for 10 year age categories. Deaths of male and female Hutterites have also been combined to increase further the size of each cell. However, the use of 10 year averages has the disadvantage of concealing age differentials in mortality and covers up trends toward lower mortality due to the improvement of health conditions within the decade. Such improvements may have been considerable, particularly during the last decade, when there has been a drastic shift in the acceptance by Hutterites of modern medical technology.

[2] Rates for South Dakota in 1947 were computed from the following sources:

(1) Population: United States Bureau of the Census ('51).

(2) Deaths: National Office of Vital Statistics ('49).

year, if their death rates were similar to those of the United States white population (table 16).

It is apparent by inspection that the Hutterite age specific death

rates are somewhat below those of the United States population except in the 1-4 year and 5-14 year age groups. This comparison is, however, not entirely satisfactory. The United States white population is a conglomorate of many social and status groups, which differ widely in their mortality rates.

The population of the State of South Dakota, being largely rural, offers a more meaningful comparison. Until 1918, all Hutterites lived there and were influenced by its standard of living and medical practices. In 1950, 15 of the 93 colonies were located there. Hutterite and South Dakota rates are fairly similar. Hutterite children under 15 years of age have a greater likelihood of dying than their counterpart in the South Dakota population. The situation is reversed for adults, Hutterites having a greater likelihood of survival in all but the 35-44 year old group.

TABLE 17

Age Specific Death Rates by Sex For Ethnic Hutterites 1941–1950 [1]

AGE	MALES			FEMALES		
	POPULATION	DEATHS	RATE	POPULATION	DEATHS	RATE
Under 15	1805	101	55.96	1838	93	50.60
15–29	903	8	8.86	957	11	11.49
30–44	495	15	30.30	456	19	41.67
45–59	238	9	37.82	212	12	56.60
60 and over	93	23	247.31	81	18	222.22
Total	3534	156	—	2544	153	—

[1] Population adjusted to the midpoint of the 1941-1950 interval.

Sex and Mortality

The death rates of Hutterite women are consistently higher than those of men in every age group except children under 15 and older people over 60 (see table 17). This finding confirms the interpretation made previously in our review of the Hutterite age distribution. Although the number of deaths in the Hutterite population, even over a 10 year period, is quite small, the pattern is sufficiently clear to be significant.

This finding contradicts what is almost a generalization among human populations: Male mortality is higher than that of females. Dublin, Lotka and Spiegelman ('49) have pointed out that this "law" applied

to almost every human and many animal species. One of the few exceptions was in the population of India in 1931, where the "average length of life was almost the same for both sexes." The general level of mortality of the Hutterites is very much below that of the people of India, but the two populations are similar in that mortality among the females in the child bearing ages is higher than that of males. Among the Hutterites, the fertility is even higher than that reported for Indians; correspondingly Hutterite female death rates are even higher than those of males, and the males of the sect clearly exceed females in life expectancy during the middle years of life. These facts suggest the hypothesis that a high number of pregnancies has a direct effect in maternal morbidity and mortality and an indirect effect on lowering resistance to general morbidity, even when women get moderately good maternal care.

The sex reversal in death rates is found only in the age period of 15-60, which corresponds somewhat to the period during which women have a large number of pregnancies. Hutterites do not seem to have an unusual number of maternal deaths, but the higher female mortality may result from a general lowering of their resistance during the childbearing period and a decade or so afterwards. Females who survive beyond their sixtieth year of life again conform to the generalization true for other populations. They have a lower mortality than males. For persons under 15 years of age, the death rate of males also conforms to the findings made for other groups. Hutterite boys have a higher death rate than girls.

It was not possible in our study to test this hypothesis further by correlating the age of death of women with their number of pregnancies. We were also unable to get reliable records of cause of death on enough persons to see if the theory might be confirmed on the basis of the conditions which precipitate death. Preparations for getting this information are being made in connection with a study of genetics of the Hutterites, now in the planning stage.

Infant Mortality

Infant mortality is an excellent statistical index of public health practices. During the birth process and the first year of life, babies are very sensitive to diseases, injuries and malnutrition. The infant mortality rate is the number of deaths of infants under one year of age per 1,000 births during a specified period of time. The average annual infant mortality rate during the period of 1946 to 1950 was 45 per 1,000.[13]

[13] There were a total of 1,422 births between 1946 and 1950 in the 80% sample

It is above the rate of 38.3 per 1,000 of the United States in 1945. It is far lower than in such technologically backward areas as Egypt (152.8) or Chile (184.1) (United Nations Demographic Yearbook, '49-'50, '51).

Hutterites place much value on having children. Parents receive considerable economic and social support to give adequate care to their youngsters. They have a great deal of self-confidence about their ability to look after children. In the past this attitude has sometimes kept them from consulting doctors on time, when their infants showed the first signs of severe illness. Their home-delivery practice, despite the conscientiousness and practical experience of their midwives, who deliver about nine-tenths of all babies born, is a handicap in cases of extreme prematurity or unexpectedly difficult deliveries. But with the Hutterites, as with the rest of the American population, the chief baby killers of yesterday, diarrhea, influenza, diphtheria, and pneumonia, have melted away into a shadowy past.[14] Hutterites are now learning about antibiotic and other "miracle" drugs. They have the money to buy them. Their infant mortality will probably drop further in the future.

Social Factors in Mortality

The results of this comparison of mortality rates make a good deal of sense in the light of the social-anthropological observations made by the field staff. Hutterites love and cherish their children as much as anyone. The existence of perhaps 5 or 6 children under the age of 10 in a single family—and such instances are the rule rather than the exception—seems to have the consequence that somewhat less attention can be given to each child than in the average South Dakota farm family. An examination of our rather incomplete records of "cause of death," as reported by parents and colony leaders, suggests that preventable

from 71 colonies with complete demographic data. In this same period, there were 64 deaths of infants born during 1946 and 1950. Infants born in 1945 but dying in 1946 have not been removed nor have deaths that might come to infants in 1951, who were born in 1950, been added. The birth rate of the sect was quite stable during the period, making this refinement unnecessary.

[14] For example, in July of 1875, 250 Hutterite immigrants arrived in Lincoln, Nebraska, after a long arduous trip by boat from Europe and by train across the United States. Diarrhea broke out among the children. Thirty six died from the disease within a few weeks. In 1918 and 1919, there were a good many deaths reported to have been caused by diphtheria. Such tragedies were also common in the general population. Since 1920, there has been no serious epidemic in the sect.

deaths are common among young people. There are reports of a fair number of accidents. Tragedies such as " fell in a tub of boiling water," or " was kicked by a horse " are found to have occurred several times.

The profound religious conviction of the sect enables parents to view accident and death in a somewhat philosophical spirit. While a dead child is mourned, parents are comforted by the belief that he will enter heaven as an angel. " Nature " sees to it often that he is replaced shortly by a new arrival.

The relatively low death rate of Hutterite adults may reflect the fact that the sect encourages good health care for its members. Hutterites have the resources necessary to pay for the best medical care available. All costs are paid by the community. On the basis of returns from 49 colonies, whose leaders made an estimate of their medical care costs in 1949 or 1950 the colonies spent about 24 dollars per capita per year to provide medical, dental and hospital care and to pay for drugs. As has been previously mentioned the mortality rates for women might be reduced somewhat through better pre- and post-natal care, but it is an open question whether any amount of medical atention could entirely eliminate the physiological consequences of the frequent pregnancies that probably account for the fact that female mortality rates exceed those of males.

The doctor who participated in our field work found that adults with severe and chronic illness were well cared for.[15] Many had visited nationally known specialists and hospitals to be diagnosed and treated. Although there is still considerable room for an improvement of health standards in the care of youngsters, Hutterite adults generally live under adequate sanitary conditions. Some medical supersititions exist, but they do not interfere with attention to severe physical illness. Deaths that could be prevented medically still take place, as they do in all parts of the United States. But their incidence is being reduced rapidly.

In general, Hutterite health conditions, as indicated by their mortality rates, can be inferred to be slightly above those of the general population of the United States. They are a shade below those of the South Dakota population. But it should be noted that in 1940 this state ranked second

[15] Robert J. Weil, Assistant Professor, Department of Psychiatry, Dalhousie University Medical School, Halifax, Nova Scotia. His judgment is based on fairly thorough physical check-ups of 298 persons and more cursory contacts with probably another 500 individuals, who came to him with requests for medical information of one kind or another.

(exceeded only by Nebraska) among the 48 states in the life expectancy of its population (Dublin, Lotka and Spiegelman, '49: 68).

NATURAL INCREASE

The Crude Rate

Natural increase is the balance of births over deaths. The crude rate of natural increase is the most common method of measurement, common because it requires only crude vital statistics. It is obtained by subtracting the death rate from the birth rate. In the Hutterite population, this rate during the decade of 1941-1950 was 41.5 per 1,000. That is extremely high. In table 18 some comparable rates from modern and technologically undeveloped countries are shown.

TABLE 18

Crude Annual Rates of Natural Increase of the Ethnic Hutterites and Selected Populations[1]

POPULATION	RATE PER 1,000 POPULATION
Hutterites (1941–1950)	41.5
Israel (1948)	20.2
Algeria (Moslem) (1949)	19.3
Jamaica (1948)	17.7
United States (1948)	14.3

[1] United Nations Demographic Yearbook ('51).

The crude rate of natural increase, like all crude rates, can give a very misleading picture of trends. It does not reflect changes in birth and death rates over a period of time, nor the age distribution of a population. Although the Hutterite vital rates have been generally more stable than those of other modern populations, it would be advisable to use a more refined measure of population growth.

Gross and Net Reproduction Rates

Natural increase can be shown more accurately by gross and net-reproduction rates. The gross reproduction rate is the number of girl babies born to a group of 100 or 1,000 women 15-49, on the basis of present birth rates, provided that all of them live through the entire reproductive span. This measure of reproduction is used to show potential fertility per generation apart from mortality. The net reproduction

rate is the same as the gross reproduction rate, except that the factor of mortality is also included in its calculation. It is a close approximation of the true rate of replacement of a population if the sexes are nearly balanced, if most of the population is married, if migration is negligible and if birth and death rates remain relatively constant for a considerable period of time. All of these factors, with the possible exception of the last are nearly true of the Hutterites. If 100 women age 15 to 49 have 100 daughters on the basis of present birth and death rates, the population is replacing itself. Its net reproduction rate is unity.

The gross reproduction rate of the Hutterites in 1946-1950 as shown in table 19 is 400.36 per 100 women. The net reproduction rate is 366.44. The difference between the two measures, about 9%, is relatively small. It reflects the low mortality rates of the population. These measures may be compared with demographic data from Palestine, a country where the gross and net reproduction rates have been tabulated for both the technologically advanced Jewish and the more primitive Moslem segments.

The Moslems of Palestine in 1940 had the highest gross reproduction rate (381) recorded in the 1950 United Nations Demographic Yearbook, somewhat less than the Hutterite rate. The net reproduction rates, which take account of mortality rates, differ radically. The mortality of Moslems in Palestine is quite high since the net reproduction rate drops by 43% to 217. Forty-three percent of the Moslem generation is lost through early death, against about 9% of the Hutterites.

The Jews of Israel (formerly the Mandate of Palestine) in 1945 had the highest net reproduction rate (161) of any *modern* population resembling the United States in cultural level and technological development. Jews who failed to reproduce themselves in most west European countries in recent decades reversed this reproductive pattern after migrating to the Holy Land. The Hutterites have gross and net reproduction rates which are about 56% higher than those of the Jews of Israel, but the mortality rates of the two populations are almost identical.

Hutterites can therefore be viewed as a modern population in their death rates but "primitive" in their birth rates. They show how a human population might grow if people believe in procreation without interference with biological reproductive potential, but live under technological conditions that give such a growing population good economic and medical support. The high fertility and low mortality of this sect combine to produce a rate of increase that may be unique in human experience.

The Growth Pattern

Was there any regularity in the Hutterite pattern of growth during the 70 year period under study? Although no complete census enumerations were made during the 70 year span equal in thoroughness and completeness to those of 1880 and 1950, the question can be answered.

There were 9 population estimates made at various times between 1900 and 1947.[16] Most of them were made by Hutterites to satisfy their

TABLE 19

Gross and Net Reproduction Rates of Ethnic Hutterites in 1946–1950

AGE	TOTAL HUTTERITE WOMEN	TOTAL BIRTHS	FEMALE BIRTHS [1]	FEMALE BIRTH RATE	FEMALES IN LIFE TABLE POPULATION U. S. 1940	NUMBER OF FEMALE BIRTHS PER 1000 WOMEN
15–19	301	18	9	5.98	471,388	28.19
20–24	252	291	144	114.29	468,101	534.99
25–29	220	421	209	190.00	463,936	881.48
30–34	180	352	175	194.44	458,922	892.33
35–39	130	224	111	170.77	452,688	773.06
40–44	96	100	50	104.17	444,558	463.10
45–49	76	16	8	21.06	433,333	91.26
Total	1,255	1,422	706	4,003.60 [2] (Gross Reproduction Rate)	3,192,926	3,664.40 (Net Reproduction Rate)

[1] Estimated from total sex ratio at births over the 5 year period (100.8).
[2] Obtained by multiplying the sum of the age specific rates by 5.

own curiosity and that of other persons who wanted to report on their way of life. One estimate, that of 1917, was contained in an official petition to President Wilson for exemption from military service because of the pacifist convictions of the sect. It is probably quite reliable. The estimates are plotted as a solid line in figure 4.

The picture of their population growth is similar to the estimates obtained when the life-table survivorship method is used. This method is particularly appropriate in the Hutterite population because its size

[16] 1900: Zieglschmid ('47).
1915: Zieglschmid ('47).
1917: Zieglschmid ('47).
1922: Clark ('22).
1926: Zieglschmid ('47).
1930: Deets ('39).
1931: Deets ('39).
1944: Zieglschmid ('47).
1947: Zieglschmid ('47).

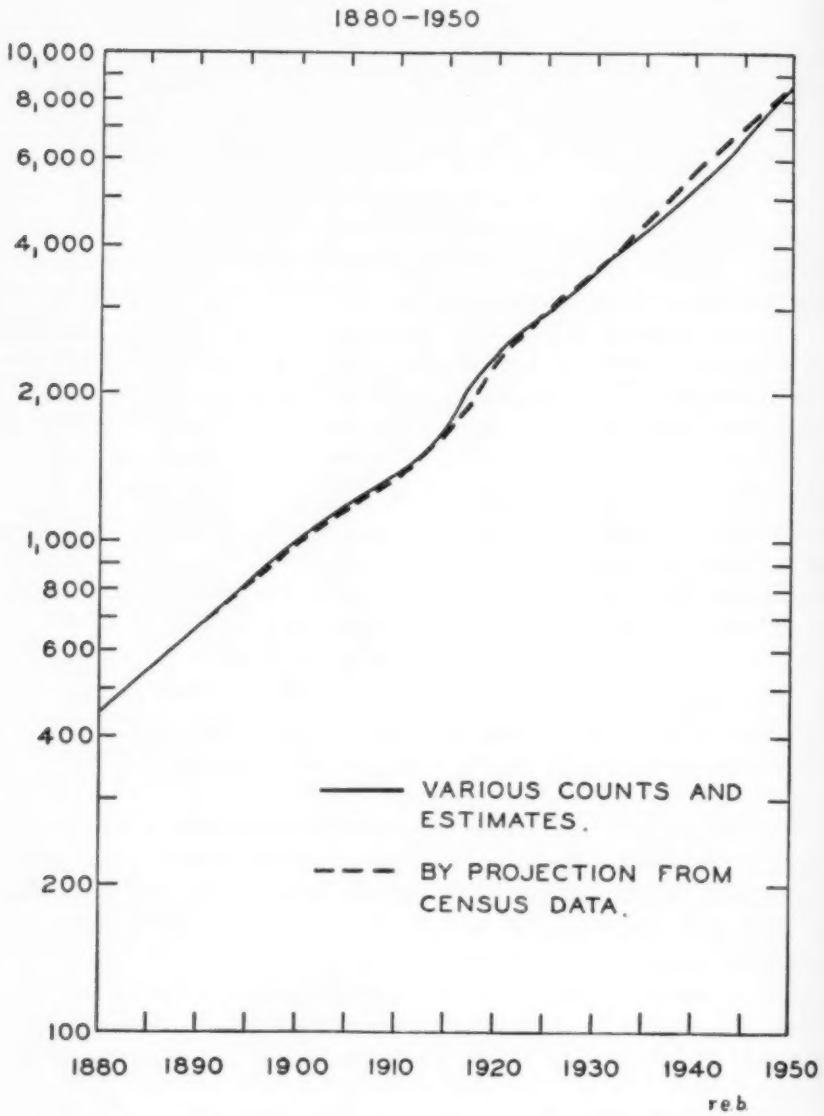

FIG. 4. GROWTH OF THE ETHNIC HUTTERITE POPULATION: 1880-1950.

and composition since 1920 was little influenced by either in- or out-migration. Life tables for the white population of the United States have been used as the most appropriate ones available to estimate Hutterite mortality rates. Using this method the 1950 population was projected backward to 1910. It was inadvisable to project backward any farther by this method since the cumulative errors become too great. Instead the 1880 population was projected to 1910 by using an average of the birth rates over the last 20 years as a measure of births in that earlier day and United States mortality rates appropriate to 1880 to compute deaths. The estimates so obtained are plotted as a broken line in figure 4.

Migration and Population Growth

The two projections fit together almost like the halves of a torn piece of paper. This is not surprising in view of the fact that migration, the social factor which is so important in the growth pattern of most modern populations, is relatively unimportant among the Hutterites. During the first few decades of the sect's residence in South Dakota, there was some movement of people into the colonies. The family groups are known to have joined up between 1880 and 1895. Another family which left Bon Homme Colony in 1878 returned a decade later. These families eventually contributed a total of 98 children who remained in the colonies. All but two or three married after they grew up. Also at least one single girl and possibly half a dozen others joined the colony to marry. They came from a group called "Prairieleut" or "Hutterite Mennonites." They were members of the same ethnic group in Russia that migrated with the colony people to the United States, but had decided to try life on an individualistic basis.

As the years went by, the cultural gap widened between the Colonyleut and the Prairieleut. The latter were more responsive to the assimilative pressures of the American environment. Their movement into the colonies stopped before the turn of the century. This study is therefore based exclusively on the descendants of the original colony Hutterites and those who joined them prior to 1895.

The accession to the population base of contemporary Hutterites was not balanced by any desertion of individuals or of families to live "life on their own." We know of only 7 small family groups and three single individuals who left prior to 1918.

The net effect of the known in- and out-migration prior to 1918 can be shown most clearly if the membership of the colonies of 1880

is corrected for individuals who were then alive and who joined or left the group before 1918. Instead of the 443 persons enumerated by the census, there would have been 472, an increase of 6.5%.

The balance of migration since 1918 has been slightly in favor of reducing the number of Hutterites. There was no new influx of *ethnic* Hutterites.[17] We found that 106 Hutterite males and 8 females were listed as being "deserters" in the 1950 census. We do not know in all cases if these "deserters" were still living at that time. If all were alive, they would constitute one of every 20 Hutterite males age 15 and over and one of every 250 females living on December 31, 1950.[18] The net effect of in- and out-migration since 1918 has probably reduced the size of the contemporary population by about one or two percent from what it would have been in 1950 if all persons ever born into a colony since 1918 could have been enumerated.

A Stable Population

The Hutterite population growth during the last 70 years resembles the statistical model of a *stable* population. Such a population must be distinguished from a *stationary* population. The latter is neither growing nor decreasing. It remains, as the term indicates, stationary in size. A stable population may be growing or decreasing, but it has a constant

[17] Eleven adult converts of non-Hutterite stock with 19 children were brought into several of the colonies after 1930. Some of the children have recently married ethnic Hutterites and have had 34 offspring by December 31, 1950. This group of 64 converts or children of convert marriages constitute less than one percent (.74%) of the entire ethnic population. They have been excluded from our study in view of their variant cultural background. Also excluded have been the populations of certain pacifist communal groups, who have adopted the name "Hutterite" in recent years. They do not intermarry with the ethnic group and have no formal relationship with them, although they have received some financial aid and spiritual advice from the ethnic Hutterites. These settlements, with a population of approximately 900 are located in England, Ontario, Canada and in Paraguay and Uruguay. All have been organized since 1930. Their membership is composed of diverse nationalities, formerly "worldly" persons. They became converted to a creed similar to that of the Hutterites in its emphasis on communal property, pacifism and adult baptism. However, they adhere to more modern customs and values in many areas of every-day living.

[18] There were 5 colonies in 1950 with 131 members, who were excommunicated for their failure, or that of their leaders, to live up to all orthodox prescriptions of the council of preachers. They are the most assimilated wing of the sect. They were included in our study of the culture because they are all of Hutterite ethnic origin, share property on a communal basis and adhere to many of the precepts of the Hutterite religion.

net reproduction rate. The true birth and death rates are stable. The total number of persons can change, but the percentage distribution by age and sex does not. The statistical model of a stable population has never, to our knowledge, been found in nature. The Hutterites come very close to showing its characteristics. We recall from figure 2 that the population pyramids of the sect showed an approximately similar shape from decade to decade, particularly after the year 1910, although the number of persons increased rapidly.

This finding is more than a statistical curiosity. It indicates that it is meaningful to compare the rates of phenomena within the sect at different times, because the composition of the population base remains the same. Within the Hutterite population even crude rates can be a basis for comparison over time.

Future Growth Predictions

At present rates of reproduction the Hutterite population would increase rapidly as shown in table 20. It cannot be over-emphasized that this is not a prediction of what will actually happen. The statistics are based on the assumption that there will be no change in the biological and social factors which have enabled the Hutterites to reproduce rapidly in the past. As shall be shown later, there are slight indications that the social factors governing fertility may change within the next few decades, resulting in a slowing down of the Hutterite rate of growth.

The true rate of natural increase was calculated by the method suggested by Glass ('40). It shows an increase of 4.1265% per year, or a doubling of the population in about 16 years. It was also found that the past growth pattern of the sect could be fitted to an exponential curve. Three exponential curves were used. Curve A is based on growth data up to 1920, a period in which the rate of growth was slower, due to higher mortality rates among the Hutterites in their first decade in the United States. It obviously underestimates, even by 1950, the actual rate of growth. Curve B is an exponential based on the 1910-1950 rate of growth. Projection as far as the year 2000 shows that it represents a faster rate of growth than the true rate of natural increase in 1946-1950. This suggests that between 1910 and 1940, Hutterites were increasing more rapidly than between 1940 and 1950. As mortality was somewhat higher we can only conclude that fertility was much higher also. This is another piece of internal evidence pointing to a possible reduction in fertility among the Hutterites in the past few years.

Exponential Curve C was fitted to the rate of growth over the entire

1880-1950 span. It closely resembles the projection of the true rate of natural increase. Thus the present true rate of natural increase approximates the long term rate of growth of the Hutterites.

It is difficult to believe that the Hutterites will actually attain any such numbers shown here. It is certain that as their numbers become larger they will attract more and more interest, both from their immediate

TABLE 20

Projections of Population Growth of the Ethnic Hutterites Under Given Assumptions

YEAR	POPULATION BASED ON TRUE RATE OF NATURAL INCREASE [1]	EXPONENTIAL CURVE A [2]	EXPONENTIAL CURVE B [3]	EXPONENTIAL CURVE C [4]
1950	8,542 [5]	5,115	8,335	7,695
1955	10,400	—	—	—
1960	12,700	8,800	13,090	11,530
1965	15,700	—	—	—
1970	19,200	—	—	—
2000	64,500	37,350	79,530	58,250

[1] The true rate of natural increase based on the 1946-1950 net reproduction rate was 4.1265%.

[2] Based on Exponential Curve log Yc = log 1.002610X +) log .078481 representing the actual population growth 1880-1920 and projected forward from 1920.

[3] Based on Exponential Curve log Yc = log 1.626969X + log .097968 representing the actual population growth 1910-1950 and projected forward from 1950.

[4] Based on Exponential Curve log Yc = log 1.271324X + log .087836 representing the actual population growth 1880-1950 and projected forward from 1950.

[5] Census count.

neighbors and from the world at large. They will no longer be able to live in their present tranquility and relative isolation. Their increase in numbers also may undermine the primary group structure supporting their cohesiveness. It is already becoming impossible for the Hutterites to maintain the informal relationships which characterized intercolony contacts during the first few decades of the twentieth century. Only recently the group has found it necessary to draw up a paper of incorporation as a church body. New ministers, who in the past could be confirmed by the council of preachers with every member knowing them intimately, will be known less and less intimately in days to come.

It will become increasingly difficult to maintain the uniformity of belief and practice which has been an important factor in Hutterite survival.

Their great growth potential constitutes one of the most serious direct threats to their continued existence as an autonomous culture. Not the Malthusian "iron law" of subsistence but a perhaps more inflexible law of antithesis between primary group relations and group size will help to bring about a gradual assimilation. The more Hutterites exist, the more colonies they form, the larger the number of contacts which in-group members make with the larger American culture. The rate of acculturation and assimilation is likely to increase even more rapidly than the population. Already there are signs that there are doubts about some of the fundamental beliefs of their system of religious values, which is an essential factor in their high true rate of reproduction. Long before their colonies begin to show overt signs of disorganization, birth rates may be a reliable indicator of the rate of change of fundamental Hutterite beliefs under the impact of competing American values.

A SOCIAL-PSYCHOLOGICAL THEORY OF POPULATION GROWTH

The Hutterite Data and the Pearl-Reed Logistic Curve

For more than a century and a half, men of science and metaphysics have shown an interest in discovering a law of population growth. Of necessity, their theories had to be "educated" guesses. They usually had to be based on qualitative impressions or official demographic statistics. Both types of data are inadequate to observe a human population over a long period of time under conditions approximating those of a controlled scientific experiment. The Hutterites have provided a unique opportunity to test some of these theories and to observe the dynamics of population growth under fairly controlled conditions.

Ideal conditions of control have been achieved only in the study of animals. Raymond Pearl experimented with populations of *Drosophila melanogaster* in half-pint milk bottles. On the basis of his findings and some other biological growth data he came to the conclusion that the biological pattern of human population growth could be described best by a logistic curve. This curve has three characteristics:

1. a slow rate of growth at the beginning
2. a fast rate of growth in the middle
3. a slow rate of growth at the end, which levels off and finally becomes asymptotic.

This mathematical model was an excellent description of his data, but its application to human beings does not necessarily follow, even though both human and animal species share certain biological qualities. There are some very crucial social-psychological differences. Unlike all lower animals, men can say *no* to reproduction. There are no celibate *Drosophila*. Human reproduction is an activity carried on within strict social rules, which in most cultures are among the most rigid and cherished proscriptions or taboos.[19]

We were unable to fit a logistic curve to the growth pattern of the Hutterite population from 1880-1950, as there was no point of inflection on the upper end of the curve. Ultimately, it may well follow such a pattern, but our data contain no biological clue that would permit us to predict how long the fertility of this population will continue to remain high, when it will begin to decline, how fast it will decline and whether the decline will be continuous. We showed previously that the rate of growth was somewhat slower prior to 1910 than after that date. Higher mortality and disease rates during the early years probably can explain this phenomenon rather than any change in fertility. There also is the suggestion of a slight diminution in the rate of growth in the latter half of the 1940-1950 period, accounted for by a drop in the age-specific birth rate of women age 35-39. In a few more years we shall be able to check whether this is merely a fluctuation around the general trend, or whether it is the beginning of an actual decline in the rate of growth. If and when the decline comes, we suspect that it will come despite a further improvement in health conditions of both mothers and children. It will be caused by a shift in Hutterite attitudes towards birth-control. As we show later, some evidence is now available that such a shift in outlook in favor of controlled parenthood is in the making.

[19] The big biological and social differences that separate man from lower animal forms are considered to be irrelevant by Raymond Pearl for natural human population growth:

"Probably a real understanding of the problems to which Malthus addressed himself is going to come more from the intensive study of lower forms of life in the laboratory, under physically and chemically controlled conditions, than from any manipulations of never quite satisfactory demographic statistics." Pearl, '25: 4-5.)

"The half-pint universe of the laboratory *Drosophila*, in its quiet incubator, is without doubt a simpler world than that in which we carry on, but in both the great realities of birth and death are the same. And it is these that count." (Pearl, '25: 18-19.)

The Hutterite Data and Malthus

Rev. Thomas Robert Malthus, often regarded as the founder of demography, postulated that human populations have a biological tendency to increase in a geometrical ratio with each generation (Malthus, '33). On the basis of what was happening in the United States he thought that under favorable conditions population would double in number approximately every 25 years. Malthus believed that the human race could not long continue increasing at this theoretically possible level. Food and other resources could not be increased at the same rate. He regarded vice, poverty, war and disease as natural checks to prevent such a calamity. He urged abstention from sexual relations and delayed marriage as being socially and morally more acceptable alternatives to prevent the calamity of mankind increasing in numbers until there would be "standing room only" on the globe (Ross, '27). Rev. Malthus might have come to an even more pessimistic conclusion if he could have seen the Hutterite demographic data. Their rate of growth has been far faster than the rate which Malthus postulated at the dawn of the nineteenth century.

Neither vice, poverty, disease nor war has been a factor in recent Hutterite history, during which their phenomenal growth has taken place. The sect's means of subsistence has increased more rapidly than their numbers. When their ancestors arrived in 1830, there was barely enough money to keep body and soul together. Contemporary Hutterite colonies are highly mechanized. The people live in well built homes. They enjoy excellent credit. Because of the belief that austerity is a religious virtue, their furnishings, clothes, and food are simple but they are adequate. No Hutterite in a colony has ever applied for or received public welfare assistance, even during the depression years. The average colony has about 6,000 acres of land, with a good water supply, electricity and a telephone. It has been able to save enough money to purchase new land and equipment and to build homes to establish a branch colony every 10 to 15 years. Hutterites, despite their rapid growth, are more prosperous today than they have ever been during the 70 year period under review.

Birth Control Practices

Birth control is a major factor affecting the demographic pattern of all modern populations. Hutterites often refer to it as murder. One informant warned that "worldly" people who engage in the practice will have to face on the Judgment Day the hundreds of unborn children

whom they have "killed." But religious belief alone is no proof of practice. Catholics have equally strong theological objections to birth control, but their fertility in urban areas is becoming more and more similar to that of persons of equivalent education, income, and social status, who have no stated religious objections to planned parenthood.[20]

The evidence is good that among Hutterites religious conviction and nuptial behavior correspond closely. The net effect of birth control practices on fertility during the period 1880-1950 has probably been close to zero, except perhaps since 1945.

We have learned of about half a dozen cases where Hutterite women were given clear-cut medical advice against further pregnancies because of serious hazards to their health. In one instance, the couple decided to use effective pharmaceutical measures of birth control. In all other cases, they seemed to have been unwilling to assume the responsibility for such a "grave sin," even upon the advice of a doctor. Some asked the doctor to perform a sterilization operation. There seems to be no theological objection to this procedure because the doctor assumes responsibility for the act.

This form of birth control is rather unusual. As has been indicated previously, the Hutterites are a medically sophisticated people. They often consult doctors. In the course of medical examinations by the physician of the field staff the presence of a number of abdominal scars among women over 35 years old was noted. It was his impression that the incidence of hysterectomies and other sterilizing operations was rather high. Whether this impression is correct awaits verification. However, our data does seem to suggest that there may be some effort to control natural fertility at this age level. The extent to which the recourse to a hysterectomy represents a conscious attempt to limit births is, of course, impossible to measure. It is plausible that a certain amount of rationalization takes place in the mind of a 34 year old

[20] According to the findings of the "Indianapolis" study, almost 90% of all 1,080 couples included in the area sample tried to control the number of children and their spacing by means of contraception. "Nearly all of those who did not make this effort were "relatively sterile," for over 98% of the "relatively fecund" couples practiced contraception. There is no doubt that birth control practices are widely used in both Catholic and Protestant groups, although Catholics in general were 18% more fertile than Protestant unions. (Vols. I and III.) About two thirds of the couples began their attempts to plan fertility at marriage; about half of the remainder began before the end of the first puerperium." (Whelpton and Kiser, '50: 253.)

mother of 8 children when faced with an operation that, in many cases, is elective and sometimes may have been medically unnecessary.

The Hutterite taboo is strongest against the use of mechanical or pharmaceutical birth control devices. The rareness of their use was unanimously agreed to by all medical informants and pharmacists with whom the problem was discussed. These impressions are strongly corraborated by the opinion expressed by all Hutterites. *Coitus interruptus* is also regarded as sinful. The "rhythm" method, which is not very reliable but is sanctioned by the Catholic Church, is neither permitted nor prohibited. The Hutterites have no official theological position, although several members were "not sure that it is right." It is doubtful that prior to about 1940 more than a very few knew of this method. At the present time, the rhythm method may be used intermittently by a few couples in some colonies. Hutterites also have no theological mandate to have sexual relations. Couples who wish to keep their family size low may abstain without fear of committing a clearly defined "sin." There is no way of estimating the effect of abstinence on the Hutterite birth rate, but we doubt that it is very great.

There is no economic pressure for planned parenthood. The communal colony of the sect provides equally for all families, regardless of size. The birth of another child in no way lowers the standard of living. The carpenter just makes another bed. The family may be given an apartment with an extra room and if the mother needs additional household help, a relative or neighbor comes in to share the work. The colony pays all medical bills.

The intimacy of personal contact in the primary group structure of each colony also mitigates against the practice of birth control. If a couple has been married for a year without a pregnancy people begin to wonder if the husband or wife is healthy. Mechanical or pharmaceutical devices could not be easily hidden from discovery of friends or close relatives, who come and go freely into any couple's rooms during the day. Those desiring to practice planned parenthood would have to make a deliberate effort to safeguard themselves from discovery, which would in itself be noted quickly. People would begin to gossip about: "What do they have to hide?"

To sum up, birth control practices are generally frowned upon. At least until about 1945, they did not influence the birth rate. Some of our demographic data indicate that since that time the Hutterite acculturation to American values may be having an effect on the fertility of women in their late thirties.

Population Growth is Influenced by Social-Psychological Factors Within Biological Limits

Women cannot conceive before the age of menarche. They must have access to fertile human male sperm. They need about 9 months to have a baby. They become infertile after their menopause. But within these biological conditions, human values, customs, and socially influenced health standards determine the growth of population.

There is no doubt that individual human beings vary in fertility. Some of these variations could have a genetic basis. If they do, the Hutterite population should show it. The existence of a genetic factor cannot be ruled out, but the weight of evidence of this study indicates that high fertility is largely determined by religious values and good medical care within a social system which provides high prestige and adequate economic support for those with large families. Since social mobility is regarded negatively and salvation after death is the most cherished goal, unlimited parenthood helps rather than hinders the life chances of a Hutterite couple.

CONCLUSIONS

An Experiment of History

The Hutterite population has grown rapidly in a fairly stable pattern for 80 years and more, under controlled conditions almost comparable to those obtained by Raymond Pearl with *Drosophila melanogaster* in their "milk bottle universes." The entire population of 8,542 persons including their leaders were not merely passive objects of scientific scrutiny. The Hutterites collaborated actively in this undertaking. They generously furnished most of the data, made extensive searches of their colony records and responded to hundreds of written or verbal inquiries. Social scientists cannot experiment with human fertility, but historical accident has provided them here with a population which meets most of the conditions of a good ex-post-facto experiment.

What set of circumstances made this experiment possible? Among the most crucial factors may be the migration of the Hutterites to North America where good medical care became available to them. In this fortune they are not unique. In 1953 there were 172 million other Americans and Canadians on the North American half of the continent who had access to the same facilities. The Hutterites maintain a high level of fertility, virtually uninfluenced by any form of birth-control. In this also they are not unique. Many primitive populations live so.

Finally, the Hutterites have a strong primary group cohesiveness and a well integrated religiously sanctioned value system, with much emphasis on mutual aid. The group guarantees each individual an equal and adequate, but austere standard of living, regardless of personal ability or fortune. The Hutterites are not unique even in this characteristic. They share these beliefs in Christian community living with many a religious order, particularly those of the Catholic Church. What is unique is the combination of the three factors. This combination makes the Hutterites appear to be "tailor-made" for a fairly well controlled study of many human problems, including the social biology of very high fertility.

Be Fruitful and Multiply

The Hutterites follow to the letter this biblical admonition to Noah. Women living in 1950 had on the average a probability of having 12 children if they were married during their eighteenth year and lived with their spouse through the end of their fertility period. The population was increasing at a rate of 4.1265% per year, or doubling in number in about 16 years. At this rate of growth it can be predicted that there will be 12,700 Hutterites in 1960, living in perhaps 130 colonies instead of the 93 in existence in 1950.

The rapid growth is taking place within a relatively stable pattern. This attribute facilitates a comparison of vital statistics of the group over time, since they are always based on a population which, despite its increase in numbers, remains stable in age and sex distribution. This fact greatly enhances its value as a social laboratory. Future studies, in which the members might be willing to cooperate, can be made with larger and larger numbers of subjects.

The rapid increase in population perpetually confronts the sect with the problem of maintaining its primary group structure, which may be essential for its survival as an autonomous culture. This is accomplished through the process of "swarming" as the Hutterites picturesquely refer to their custom of establishing a branch colony whenever the population gets much above 100.

Accent on Youth

There are two ways in which a population may remain predominantly youthful. In the "primitive way" individuals die prematurely; in the "Hutterite way" there is constant expansion through a very high birth rate. Although in the latter case adults live a long time, they are

perpetually outnumbered by successive and increasing waves of children, most of whom survive. Over 61% of the Hutterite population in 1950 had not reached full adulthood. Such a population could not be supported easily in a highly individualistic and competitive economy, where each individual and family strives to maximize its standard of living. Through group responsibility for each member, Hutterites assure security from birth to death.

Young people are not without opportunities for satisfying their aspirations, although the Hutterite culture imposes many limitations. Many of the goals common to most young Americans are taboo to the Hutterites, including such central values as "getting ahead in the world" or a maximum utilization of new inventions designed to increase creature comforts. Hutterites recognize that their way of life is what they call "a narrow road," but they teach their young people to travel it in order to attain religious salvation. The Hutterite youth have opportunities for achieving the aspirations sanctioned by their value system. New branch colonies are established frequently. This expansion provides opportunities for persons who want to be farm department heads, managers and preachers.

Over-all Low Mortality

Hutterites are a "primitive" population in having a high fertility pattern, but are quite modern in their mortality rates. Adults tend to live longer than other American whites and Hutterite children under 15 have a slightly higher death rate. There is evidence that the sophistication of Hutterites about medical care is growing. This probably will reduce the number of juvenile deaths. Since over half of the group is composed of children under 15, a reduction in the death rate of children would increase still further the already high net-reproduction rate of the group, unless this trend is counter-balanced by birth control measures.

Men outlive their wives

Unlike the situation in most other populations, Hutterite men tend to outlive their wives. This dramatic reversal of the generalization that females are the "stronger" sex with regard to longevity is probably largely a result of the very high fertility of Hutterite females. Few Hutterite women die because of pregnancy or in childbirth but it is probable that the frequent repetition of child bearing lowers their resistance to morbidity. We do not know if the relationship between fertility and mortality is linear and direct. There may be an optimum

number of pregnancies which have no unfavorable effect on longevity, but beyond which such effects begin to set in. The implications need to be studied further.

Fecundity versus Poverty

The claim advanced by the nutritionist de Castro ('52) that the hungry peoples of the earth are the most fertile is certainly not borne out in the case of the Hutterites. Not only are the Hutterites amply fed but their fertility has increased since their early days in this country when their diet was often far less adequate than it is today. The steady rise in fertility coupled with an increasing standard of living completely contradicts the concept of de Castro, in so far as this group is concerned.

Fertility Decreases Slowly With Age

The population fecundity of the Hutterites has been estimated to lie within the range of 12 to 14 live births for the average woman who is exposed to pregnancy throughout her reproductive period from menarche to menopause.

The peak of fertility of the population lies at the 22nd year of life, when 7 of every 10 women who were married between 1941-1950 had a live birth. There was an average of more than three babies per woman if they were married during the 20-24 year age span. Fertility declined gradually, but not rapidly. At 39 one in three Hutterite women had a child annually. In the forty-sixth year, only one in ten women had a baby, and after that age fertility dropped very rapidly. Nevertheless, there were 86 chances per 1,000 that a woman who had lived with her husband between her forty-seventh and her fifty-first year of life became a mother.

The high fertility of the Hutterite population is not due to the presence of a small number of extremely fecund couples. It is a result of a generally high level of reproductivity. No Hutterite female had more than 16 children. Nor does the birth rate reflect an unusually large "litter" size. Twins were only about as common as they are in the general population.

The Reproductive Efficiency of Human Beings

Our evidence disagrees somewhat with that of Raymond Pearl concerning pregnancy in families which do not engage in controlled parenthood practices. Despite the short life span of both the human ovum and the sperm, copulation among the Hutterites results in conception

with far greater frequency than would be expected from the reports of families whose fertility patterns were studied in detail by Pearl.

The total sterility rate of Hutterites is low. The number of women who had no children at all at the conclusion of their reproductive period was only 10 out of 240 or about 3%. Both of these facts taken together seem to suggest a higher rate of reproductive efficiency among human beings than has generally been believed in the past.

Implications for Aid to Underdeveloped Countries

The Hutterite culture is not unique in its positive emphasis on fertility. In many parts of the world people believe, for religious or nationalistic reasons, that maximum reproduction is a virtue. Areas like Japan, China, India and Java are densely populated. Most of their inhabitants know nothing about planned parenthood practices. Their religious values are often opposed to such practices. The Malthusian checks of poverty, disease, and malnutrition operate in these areas to keep population growth far below the Hutterite level.

The United States government is now giving technical aid to many of these underdeveloped regions. Agricultural, industrial, and medical "missionaries" are introducing tractors, penicillin and powdered milk. Major famines and epidemics which have reduced population of these technologically backward areas, are being gradually eradicated. The Hutterites demonstrate what might happen as these people begin to live under modern sanitary conditions without practicing birth control. Death rates will decline sharply, but fertility will remain high for a fairly long period and sharp rates of growth will ensue.

Birth as a Social-Psychological Phenomenon

The birth of a baby is a biological event, influenced by genetic factors many of which are still unknown. Within these limits, the probability of birth, survival, and death is very greatly influenced by social and psychological factors. The high rate of Hutterite reproduction is facilitated by at least 5 social-psychological tendencies:

1. The culture puts much positive value on having children; any form of birth control is regarded as sinful.
2. The community and its values assure economic support to parents who have as many children as they can biologically conceive.
3. Hutterites can and are willing to pay for good medical care.
4. Only a very small proportion of the adults fails to get married.

5. There is little migration, travelling, marital separation, or divorce to separate husband from wife during the fertility period. There are few occasions when married women have no opportunity to reproduce.

Hutterite fertility is not equal to the postulated theoretical level of fecundity because some of their values and customs work against reproduction:

1. Hutterites believe that sex relations prior to marriage are very sinful. Many measures are taken to prevent their occurrence, including strict supervision of adolescents, strong indoctrination of all persons against pre-marital relations and punishment through ritual excommunication (the most severe Hutterite punishment) of any persons who do have such illicit relations.
2. Hutterites believe that no one can be married prior to being baptised. Since baptism can be administered only to mature adults, who show a satisfactory understanding of, and appreciation for the Hutterite creed, few boys and girls are baptized before they reach the age of 19 or 20.
3. Hutterites believe it is "good" for a girl not to marry "too early." The reasons given for this attitude are numerous, such as "I do not want to leave my family too soon" or "When you get married, there is so much more work for a girl." Between 1880 and 1905, the median age of marriage for 78 females was about 19.5 years. In 1950, the median age of marriage of all women then living was 22 years.
4. There are isolated instances of surgical interference with reproduction to protect a mother's health. Certain birth control practices may already be coming into use particularly among women over 35 years of age. They have not had much impact on fertility as yet, but may become a factor in future population growth. The tendency for a reduction in the frequency of sexual relations with increasing age, which has been noted in other populations, may also exist among the Hutterites. It may always have had an effect on keeping their fertility below the theoretically possible level.

The essential core of Hutterite beliefs have changed little during the past 70 years, a period during which the sect has adopted many of the technological inventions of its neighbors. Up to now, Hutterites seem to reverse the general tendency of that human reproduction to decline

with the increasing diffusion of modern technology. But the pressures of the American environment are beginning to have an effect (Eaton, '52). New values which might effect fertility are competing with the old standards. Hutterite women talk on occasion about the advantages of "worldly" mothers, who can enjoy life by not being burdened by "too many children." The limitation of family size is increasingly urged by some doctors for reasons of health. These pressures are rarely sufficient to overcome the Hutterite belief that any form of birth control will lead the user to eternal damnation. The cohesiveness of the group is still strong. However, as the acceptance of these competing social values increases, Hutterite fertility is likely to decrease. The two factors are closely related. Hutterite fertility may give a positive indication of major changes in the basic values long before these changes lead to any break-up of a community.

ACKNOWLEDGMENT

The data for this report were gathered in connection with the study "Cultural and Psychiatric Factors in the Mental Health of the Hutterites," Project MH 255, financed by grants of the National Institute of Mental Health of the United States Public Health Service. A grant from the Milbank Memorial Fund paid for the preparation of the manuscript for publication. We are indebted to Robert J. Weil and Bert Kaplan, who participated in the general field work of this study and to William F. Pratt, Rev. Samuel Kleinsasser, Thomas F. A. Plaut, Evelyn McPuroff Plaut and Helen Fay Eaton, who helped in the recording of the population data. The last three persons, Clyde V. Kiser, Bentley Glass, and Arthur G. Steinberg read the entire manuscript and made many valuable suggestions. Mary Kemsley, our secretary, nursed the copy through its many revisions and Ralph Brehmer made the charts. No acknowledgment would be complete without mention of the fact that hundreds of Hutterites searched their records and memories to provide the information. They contributed many hours of their labor.

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BALTIMORE—18, MARYLAND, U. S. A.